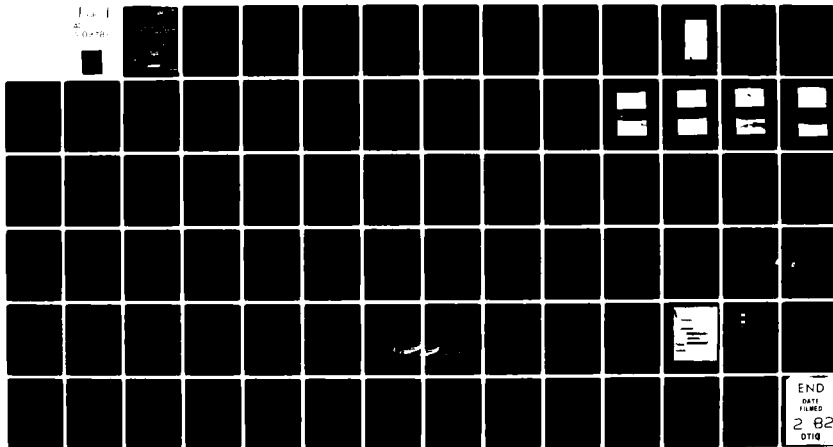


AD-A109 781

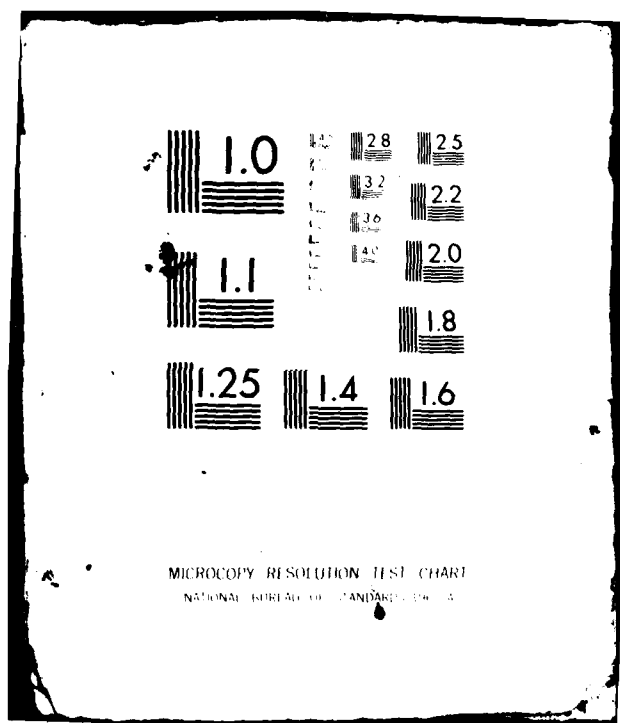
D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA F/G 13/13  
NATIONAL DAM SAFETY PROGRAM. NANTICOKE CREEK WATERSHED PROJECT---ETC(U)  
AUG 81 L D ANDERSEN DACW51-81-C-0011

UNCLASSIFIED

NL



END  
DATE  
FILMED  
2 82  
DTIC



AD A109781

SUSQUEHANNA RIVER BASIN

**NANTICOKE CREEK  
WATERSHED PROJECT FLOODWATER  
RETARDING DAM SITE 9-C**

BROOME COUNTY, NEW YORK

INVENTORY NO. N.Y. 628

"Original contains color  
plates: All DTIC reproductions  
will be in black and  
white"

DTIC  
ELECT  
S JAN 20 1968



ONE FILE COPY

NEW YORK DISTRICT ENGINEER

ADVISOR

**RECOMMENDATION**  
FOR THE  
CONSTRUCTION OF  
A FLOODWATER  
RETARDING DAM AT  
SITE 9-C

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A109 781	
4. TITLE (and Subtitle) Phase I Inspection Report Floodwater Retarding Dam No. 9 C Susquehanna River Basin, Broome County, NY Inventory No. 628		5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program
7. AUTHOR(s) LAWRENCE D. ANDERSEN		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS D'Appolonia Consulting Engineers, Inc. 10 Duff Road Pittsburgh, PA 15235		8. CONTRACT OR GRANT NUMBER(s) DACW51-81-C-0011
11. CONTROLLING OFFICE NAME AND ADDRESS Department of the Army 26 Federal Plaza New York District, CoFE New York, New York 10287		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
13. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Department of the Army 26 Federal Plaza New York District, CoFE New York, NY 10287		12. REPORT DATE 14 August 1981
		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)  Approved for public release; Distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety National Dam Safety Program Visual Inspection Hydrology, Structural Stability. Floodwater Retarding Dam No. 9 C Susquehanna River Basin Broome County		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. Based on the evaluation of the existing conditions, the condition of the Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C is considered to be good. The examination of documents and visual observations did not reveal conditions which constitute a hazard to human life or property.		

✓  
The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of 100 percent of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is rated to be adequate.

## PREFACE

This report is prepared under the guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
F- Dist Dist Codes Dist and/or Dist Special	
A	

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
NANTICOKE CREEK WATERSHED PROJECT -  
FLOODWATER RETARDING DAM SITE 9-C  
N.Y. 628  
DEC I.D. NO. 85D-3443  
SUSQUEHANNA RIVER BASIN  
BROOME COUNTY, NEW YORK

TABLE OF CONTENTS

	<u>PAGE NO.</u>
ASSESSMENT	iv
OVERVIEW PHOTOGRAPH	vi
SECTION 1: PROJECT INFORMATION	1
1.1 GENERAL	1
1.2 DESCRIPTION OF PROJECT	1
1.3 PERTINENT DATA	2
SECTION 2: ENGINEERING DATA	5
2.1 DATA AVAILABLE	5
2.2 GEOLOGY	5
2.3 SUBSURFACE INVESTIGATION	6
2.4 EMBANKMENT AND APPURTENANT STRUCTURES	6
2.5 CONSTRUCTION RECORDS	6
2.6 OPERATING RECORDS	6
2.7 EVALUATION OF DATA	7
SECTION 3: VISUAL INSPECTION	7
3.1 FINDINGS	7
3.2 EVALUATION	8
SECTION 4: OPERATION AND MAINTENANCE PROCEDURES	8
4.1 PROCEDURES	8

TABLE OF CONTENTS  
(Continued)

	<u>PAGE NO.</u>
4.2 MAINTENANCE OF THE DAM	8
4.3 WARNING SYSTEM IN EFFECT	8
4.4 EVALUATION	8
SECTION 5: HYDRAULIC/HYDROLOGY	9
5.1 DRAINAGE AREA CHARACTERISTICS	9
5.2 ANALYSIS CRITERIA	9
5.3 SPILLWAY CAPACITY	9
5.4 RESERVOIR CAPACITY	9
5.5 FLOODS OF RECORD	9
5.6 OVERTOPPING POTENTIAL	9
5.7 EVALUATION	9
SECTION 6: STRUCTURAL STABILITY	10
6.1 EVALUATION OF STRUCTURAL STABILITY	10
SECTION 7: ASSESSMENT/RECOMMENDATIONS	11
7.1 ASSESSMENT	11
7.2 RECOMMENDATION	11
 <u>APPENDIX</u>	
A. PHOTOGRAPHS	
B. VISUAL INSPECTION CHECKLIST	
C. ENGINEERING DATA CHECKLIST	
D. HYDROLOGY AND HYDRAULIC ANALYSES	
E. PLATES	
F. GEOLOGY MAP	



TABLE OF CONTENTS  
(Continued)

G. STABILITY ANALYSES

H. REFERENCES

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Nanticoke Creek Watershed Project -  
Floodwater Retarding Dam Site 9-C  
N.Y. 628

State Located: New York

County Located: Broome

Stream: Nanticoke Creek (a tributary of the  
Susquehanna River)

Date of Inspection: March 25, 1981 and June 3, 1981

ASSESSMENT

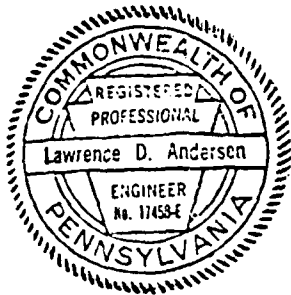
Based on the evaluation of the existing conditions, the condition of the Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C is considered to be good. The examination of documents and visual observations did not reveal conditions which constitute a hazard to human life or property.

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of 100 percent of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is rated to be adequate.

The following recommendation should be implemented within three months from notification to the owner:

1. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.

Assessment - Nanticoke Creek Watershed Project - Floodwater Retarding  
Dam Site 9-C



*Lawrence D. Andersen*  
Lawrence D. Andersen, P.E.  
Vice President  
D'Appolonia Consulting Engineers, Inc.  
Pittsburgh, Pennsylvania

Approved by:

*Col. W. M. Smith, Jr.*  
Col. W. M. Smith, Jr.  
New York District Engineer

Date:

*14 Aug 61*

NANTICOKE CREEK WATERSHED PROJECT -  
FLOODWATER RETARDING DAM SITE 9-C

N.Y. 628

DEC I.D. 85D-3443

MARCH 25, 1981



OVERVIEW

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
NANTICOKE CREEK WATERSHED PROJECT -  
FLOODWATER RETARDING DAM SITE 9-C  
N.Y. 628  
DEC I.D. NO. 85D-3443  
SUSQUEHANNA RIVER BASIN  
BROOME COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

The inspection was to evaluate the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property, and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances

Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C consists of an earth embankment approximately 870 feet long with a maximum height of about 33 feet from the downstream stream bed. The embankment has a crest width of 14 feet and an upstream slope of 3 horizontal to 1 vertical, with a 10-foot-wide berm near normal pool level. The downstream slope is 2.5 horizontal to 1 vertical. The upstream and downstream faces of the dam are covered with grass.

The spillway facilities for the dam consist of two vegetated earth emergency channels, one on each abutment, and a riser-type primary spillway located at the center of the dam. The emergency spillways are trapezoidal earth channels with a base width of 100 feet and side slopes of 3 horizontal to 1 vertical on the embankment side and 2.5 horizontal to 1 vertical on the abutment side. The primary spillway structure is comprised of a concrete intake riser structure which discharges into a 36-inch reinforced concrete pipe terminating at a concrete impact basin at the downstream toe. Under normal conditions, the reservoir level is maintained at the crest level of a two-foot two-inch-wide by two-foot-high rectangular orifice on the upstream side of the riser. The primary spillway discharge pipe has been provided with antiseep collars.

The dam is equipped with a 12-inch-diameter reservoir drainpipe extending from the upstream toe to the primary spillway riser. Flow through the pipe is controlled by a manually operated sluice gate at the riser.

b. Location

The dam is located on Nanticoke Creek, a tributary of the Susquehanna River approximately three miles northwest of Nanticoke in Broome County, New York. Plate 1 illustrates the location of the dam.

c. Size Classification

The dam is classified as small based on its 33-foot height and 899 acre-feet maximum storage capacity.

d. Hazard Classification

The dam is classified to be in the high hazard category. The Village of Nanticoke located about three miles downstream from the dam and two farmhouses located about two miles downstream from the dam are considered to be within the potential floodplain of Nanticoke Creek.

It is estimated that failure of the dam under maximum pool level would cause loss of more than a few lives and appreciable property damage in this area.

e. Ownership

The dam is owned and operated by Broome County, New York. (Address: Broome County Commissioners, P.O. Box 1766, Binghamton, New York 13902, (607) 772-2100)

f. Purpose of Dam

The dam is a floodwater retarding structure.

g. Design and Construction History

The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS) in 1965. Construction of the dam was completed in June 1967.

h. Normal Operating Procedure

The reservoir is normally maintained at the crest level of the uncontrolled orifice on the upstream side of the primary spillway riser at Elevation 1189.6 (USGS Datum). The primary spillway crest is at Elevation 1197.8, and the emergency spillway crests are located at Elevation 1206.0.

1.3 PERTINENT DATA

Elevations referred to in this section and subsequent sections of the report were obtained from design and as-built drawings.

<u>a. Drainage Area</u> (sq. mi.)	4.36
<u>b. Discharge at Dam</u> (cfs)	
Principal spillway at top of dam	193
Auxiliary spillway at top of dam	8281
Reservoir drain at top of dam	20 <sup>±</sup>
Total spillway capacity at top of dam	8474
<u>c. Elevation (USGS Datum) (feet)</u>	
Top of dam	1211.3
Auxiliary spillway crest	1206.0
Principal spillway crest	1197.8
Low stage inlet, invert elevation (normal pool)	1189.6
Reservoir drain, invert elevation	1182.0
<u>d. Reservoir</u> (acres)	
Surface area at top of dam	69.7
Surface area at crest of auxiliary spillway	55.8
Surface area at crest of principal spillway	36.1
Surface area at low stage inlet (normal pool)	13.0
<u>e. Storage Capacity</u> (acre-feet) <sup>(1)</sup>	
Top of dam	899
Auxiliary spillway crest	567
Principal spillway crest	193
<u>f. Dam</u>	
Type	Earth embankment
Length	870 feet
Height	33 feet
Top width	14 feet
Side slopes	Downstream: 2.5H:1V
	Upstream: 3H:1V
Zoning	No
Impervious core	No
Cutoff	Yes
Grout curtain	No
<u>g. Primary Spillway</u>	
Type	Drop Inlet
Length	18 feet (total weir length)
Crest Elevation	1197.8
<u>h. Emergency Spillway</u>	
Type	Two trapezoidal earth channels
Length	100 feet each
Crest elevation	1206.0

<sup>(1)</sup>Storage capacity above normal pool level.

i. Reservoir Drain  
Type

Length  
Access  
Regulating Facility

12-inch corrugated  
metal pipe  
20 feet  
Through riser  
Sluice gate



## SECTION 2: ENGINEERING DATA

### 2.1 DATA AVAILABLE

Available information was obtained from New York State Department of Environmental Conservation, Dam Safety Division files, and from the files of the SCS in Syracuse, New York. Available information includes design and as-built drawings, engineering reports, and dam inspection reports by the SCS.

### 2.2 GEOLOGY

The dam at Site 9-C is located in the glaciated Allegheny Plateau section of the Appalachian Plateau Province. A regional geology map is included in Appendix F. This region is characterized as a maturely dissected plateau with the topographic features modified by continental glaciation, including deposition of glacial till in the valleys.

The dam site is located near the axis of a northeast trending anticline (approximately north 70 degrees east). The folding is gentle with the maximum dip of the limbs being one to two degrees. The dip of the strata are affected locally by the folding; however, regionally, the rock strata dip south to southwest at approximately 100 to 150 feet per mile. The most prominent fracture orientations in the region have a strike of north 10 degrees west and are nearly vertical. A secondary fracture trace strikes north 60 to 65 degrees east and is vertical. Less prominent fractures strike north 75 to 80 degrees west and north 15 degrees east. A prominent north 85 degrees west linear trends through the dam.

The rock strata in the area consist of unconsolidated Pleistocene glacial till (Binghamton Drift) underlain by strata of the Sonyea Group (Upper Devonian Age). The glacial till consists of a mixture of clay and silt with varying quantities of gravel. The glacial till is relatively thin on hilltops and slopes and thicker in the valleys. The glacial till in the valley is greater than 50 feet thick. The bedrock consists of a thick sequence of interbedded gray calcareous shale, gray and greenish-gray siltstone and silty shale, brown, gray, and dark gray shale, and black fissile shale.

The abutment slopes are relatively gentle and not susceptible to landslide slope movement.

### 2.3 SUBSURFACE INVESTIGATION

A subsurface investigation was conducted by the SCS in 1966. This program consisted of 19 borings and numerous test pits. The location of the borings and test pits are shown in Plate 2. The boring logs are included in Plate 3.

In general, the soils in the vicinity of the dam were classified as brown-gray mottled glacial till consisting of silty gravel, clayey gravels, and sandy silts.

#### 2.4 EMBANKMENT AND APPURTENANT STRUCTURES

Plate 2 and Plates 4 through 7 show the plan, section and details of the dam and appurtenant structures. The dam is a homogenous embankment with a central trapezoidal cutoff trench. A trench type internal drainage system was provided beneath the downstream slope, parallel to the embankment center line. The drainage system discharges into the primary spillway impact basin.

The dam was designed to have a 2.5 horizontal to 1 vertical slope on the downstream face, and a 3 horizontal to 1 vertical slope on the upstream face with a crest width of 15 feet. A berm was provided on the upstream slope near normal pool level.

Available hydrology and hydraulic data consist of the SCS hydrology and hydraulic calculations. The calculations are available in SCS files.

#### 2.5 CONSTRUCTION RECORDS

The dam was constructed under the supervision of the SCS. Complete construction records are available in SCS files. No major post-construction changes were instituted.

#### 2.6 OPERATING RECORDS

Because the dam is an ungaged flood retarding structure, no operating records are maintained for the dam. During severe weather conditions, the dam is monitored by the SCS and Broome County personnel.

#### 2.7 EVALUATION OF DATA

The information obtained from the state and SCS files is considered to be adequate for Phase I inspection purposes.

## SECTION 3: VISUAL INSPECTION

### 3.1 FINDINGS

#### a. General

Visual inspections of the dam were conducted on March 25 and June 3, 1981. On both dates, the pool level was approximately at the invert level of the rectangular orifice located on the upstream face of the riser.

#### b. Embankment

No signs of distress, seepage, or misalignment were observed. The faces of the dam and the crest are covered with grass and found to be adequately maintained. The top of the dam was surveyed relative to the emergency spillway crest elevation and found to be in the range of 0.1 to 1.0 foot above the design level (El. 1211.3).

#### c. Primary Spillway

The primary spillway facilities consist of a concrete drop inlet structure discharging into a 36-inch reinforced concrete pipe with antiseepage collars and terminating at an impact basin at the downstream toe. Components of the primary spillway were found to be in satisfactory condition.

#### d. Emergency Spillway

The emergency spillways consist of two trapezoidal vegetated earth channels, one on each abutment. Both spillways were found to be in good condition. The grass cover is well established and adequately maintained. The approach and discharge channels were found to be free of brush and trees or debris which may pose a potential for blockage of the spillways.

#### e. Reservoir Drain

The reservoir drain facilities consist of a 12-inch-diameter corrugated metal pipe, extending from the upstream toe to the primary spillway riser. Flow through the pipe is controlled by a manually operated sluice gate located in the primary spillway riser. The system is reported to be operational, but its operation was not observed.

#### f. Downstream Channel

The downstream channel below the primary spillway concrete impact basin is the natural stream bed. The channel appears to be stable in the near vicinity of the dam.

#### g. Reservoir

There are no visible signs of instability or sedimentation problems within the reservoir area.

### 3.2 EVALUATION

The dam was found to be in good condition. At this time, no conditions were observed that would require remedial action.

## SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

### 4.1 PROCEDURES

The reservoir is normally maintained at the crest of the rectangular orifice inlet with excess inflow discharging through the primary spillway riser. The dam is a flood retarding structure and has no formal operating procedure.

### 4.2 MAINTENANCE OF THE DAM

The dam is maintained by Broome County Soil and Water Conservation District and the maintenance condition of the dam is considered to be satisfactory.

### 4.3 WARNING SYSTEM IN EFFECT

No formal warning system exists for the dam.

### 4.4 EVALUATION

The maintenance condition of the dam is considered to be good. Development of a formal warning system is considered to be advisable. It is reported by the SCS, Broome County office, that such a plan is in progress.

## SECTION 5: HYDRAULIC/HYDROLOGY

### 5.1 DRAINAGE AREA CHARACTERISTICS

Nanticoke Creek Watershed Project - Floodwater Retarding Dam  
Site 9-C has a watershed of 4.36 square miles. The drainage area is comprised of woodlands and farmlands. Relief ranges from moderate to steep.

### 5.2 ANALYSIS CRITERIA

The PMF inflow hydrograph for the reservoir was determined using the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers. The data used for the computer input are presented in Appendix D.

### 5.3 SPILLWAY CAPACITY

The spillway facilities for the dam consist of a primary and two emergency spillways. The emergency spillways are trapezoidal earth channels with a base width of 100 feet. Based on the available head relative to the top of the dam, the combined capacity of the primary and emergency spillways is calculated to be 8474 cfs. The rating calculations for the primary and emergency spillways are included in Appendix D.

### 5.4 RESERVOIR CAPACITY

The dam impounds a reservoir with a storage capacity of 193 acre-feet at the primary spillway crest level (Elevation 1197.8), 567 acre-feet at emergency spillway crest level (Elevation 1206.0), and 899 acre-feet at the top of the dam (Elevation 1211.3).

### 5.5 FLOODS OF RECORD

No data available.

### 5.6 OVERTOPPING POTENTIAL

The PMF inflow hydrograph was determined according to the recommended procedure and was found to have a peak flow of 8789 cfs. The hydrograph was routed through the reservoir and the dam was found to pass full PMF with the reservoir at Elevation 1211.36, which is slightly above the dam crest level at Elevation 1211.30.

### 5.7 EVALUATION

The spillway can pass the recommended spillway design flood of full PMF with minor overtopping of the embankment; therefore, the spillway capacity is classified to be adequate according to the recommended criteria.

## SECTION 6: STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

#### a. Visual Observations

As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam at this time. However, it should be understood that because the dam is a flood control facility and was at normal low pool level at the time of inspection, it was not under maximum loading conditions which would occur only during the passage of major floods.

#### b. Design and Construction Data

The dam was designed based on geological and geotechnical studies including a subsurface investigation, laboratory materials testing and engineering analysis. A SCS memorandum dated March 10, 1965 is included in Appendix G, which summarizes the findings and results of the design investigation.

The stability analysis was performed using the Swedish Circle Method. The parameters used were: internal friction angle, 22 degrees; cohesion, 230 pounds per square foot; saturated and submerged unit weights of 138 and 75 pounds per cubic foot, respectively.

The factors of safety were reported to be 1.53 for the 3 horizontal to 1 vertical upstream slope under rapid drawdown conditions and 1.56 for the 2.5 horizontal to 1 vertical downstream slope under steady state seepage conditions. The available information was reviewed and found to be adequate.

The calculated factors of safety for this dam are in excess of the minimum factor of safety recommended by the Corps of Engineers. The dam is, therefore, considered to have an adequate safety factor for stability.

#### c. Postconstruction Changes

None reported.

#### d. Seismic Stability

The dam is located in Seismic Zone 1. Based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard from earthquakes.

## SECTION 7: ASSESSMENT/RECOMMENDATIONS

### 7.1 ASSESSMENT

#### a. Safety

Visual observations indicate that Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C is in good condition. No conditions were observed that would significantly affect the overall performance of the structure at this time. However, as previously noted, the dam was not inspected under its maximum loading condition which would occur when the reservoir is filled during major storms.

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of full PMF with minor overtopping of the embankment; therefore, the spillway capacity is classified to be adequate.

#### b. Adequacy of Information

Available information, in conjunction with visual observations, is considered to be sufficient to make a Phase I evaluation.

#### c. Need for Additional Investigations

No additional investigation is considered to be required at this time.

#### d. Urgency

The action recommended below should be implemented within three months from notification to the owner.

### 7.2 RECOMMENDATION

1. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.

APPENDIX A  
PHOTOGRAPHS





PHOTOGRAPH NO. 1  
Dam Crest (looking east)



PHOTOGRAPH NO. 2  
Upstream Slope and Left Spillway Approach



PHOTOGRAPH NO. 3  
Emergency Spillway at Left Abutment  
(looking west)



PHOTOGRAPH NO. 4  
Emergency Spillway at Right Abutment  
(looking east)



PHOTOGRAPH NO. 5  
Toe of Dam and Discharge Channel  
(looking south)



PHOTOGRAPH NO. 6  
Primary Spillway Concrete Riser



PHOTOGRAPH NO. 7  
Primary Spillway Impact Basin



PHOTOGRAPH NO. 8  
One Farm and One Home (2 miles)

APPENDIX B  
VISUAL INSPECTION CHECKLIST

APPENDIX B  
VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Nanticoke Creek Watershed Project -  
Floodwater Retarding Dam Site 9-C

Fed. I.D. # N.Y. 628 DEC Dam No. 85D-3443

River Basin Susquehanna River Basin

Location: Town Nanticoke

Stream Name Nanticoke Creek

Tributary of Susquehanna River

Latitude (N) 42° 18.4' Longitude (W) 76° 04.8'

Type of Dam Earth

Hazard Category Significant

Date(s) of Inspection March 25, 1981 and June 3, 1981

Weather Conditions Cloudy, Temp. 39 degrees

Reservoir Level at Time of Inspection El. 1190 +  
(USGS Datum)

- b. Inspection Personnel Lawrence Andersen, P.E.; James Poellot,  
P.E.; Bilgin Erel, P.E.; Wah-Tak Chan, P.E.; and Arthur Smith
- c. Persons Contacted (Including Address & Phone No.) \_\_\_\_\_  
Mr. Carl S. Young, Broome County Executive, P.O. Box 1766,  
Binghamton, N.Y. 13902, (607) 772-2100 and Mr. Gary Page,  
Broome County, SCS Office, (607) 773-2751

d. History:

Date Constructed June 1967 Date(s) Reconstructed N/A

Designer USDA Soil Conservation Service

Constructed by Aschcraft Excavating Company

Owner Broome County, N.Y.

2) Embankment

a. Characteristics

(1) Embankment Material Earth

(2) Cutoff Type Trapezoidal cutoff trench, 12 feet wide at the base, 6 to 10 feet deep.

(3) Impervious Core None

(4) Internal Drainage System A trench drain equipped with an 8-inch corrugated metal pipe.

(5) Miscellaneous --

b. Crest

(1) Vertical Alignment Good

(2) Horizontal Alignment Good

(3) Surface Cracks None

(4) Miscellaneous --

c. Upstream Slope

(1) Slope (Estimate) 3H:1V (as designed), 2.9H:1V (as measured)

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions None

(4) Slope Protection Vegetated Slope

(5) Surface Cracks or Movement at Toe None

d. Downstream Slope

(1) Slope (Estimate) 2.5H:1V (as designed);

2.5H:1V (as measured)

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions None

(4) Surface Cracks or Movement at Toe None

(5) Seepage None

(6) External Drainage System (Ditches, Trenches, Blanket)

None

(7) Condition Around Outlet Structure Good

(8) Seepage Beyond Toe None

e. Abutments - Embankment Contact

No problems observed.



(1) Erosion at Contact None

(2) Seepage Along Contact None

3) Drainage System

a. Description of System A trench drain equipped with an  
8-inch-diameter perforated pipe.

b. Condition of System Only downstream end of the drain  
pipes are visible.

c. Discharge from Drainage System 1  $\pm$  gpm from both drain  
pipes.

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs,  
Piezometers, etc.)

None

5) Reservoir

- a. Slopes Moderate to steep, no problems observed.
- b. Sedimentation No problems observed.
- c. Unusual Conditions Which Affect Dam None

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) Village of Nanticoke is located three miles downstream.
- b. Seepage, Unusual Growth None
- c. Evidence of Movement Beyond Toe of Dam None
- d. Condition of Downstream Channel Good

7) Spillway(s) (Including Discharge Conveyance Channel)

In good condition.

- a. General Service Spillway: SCS concrete riser discharging into a 36-inch-diameter reinforced concrete pipe.  
Auxiliary Spillway: Two vegetated earth channels on each abutment.
- b. Condition of Service Spillway Good

c. Condition of Auxiliary Spillway Good

d. Condition of Discharge Conveyance Channel Good

8) Reservoir Drain/Outlet

Type: Pipe X Conduit \_\_\_\_\_ Other \_\_\_\_\_

Material: Concrete \_\_\_\_\_ Metal \_\_\_\_\_ Other Corrugated  
metal pipe

Size: 12-inch-diameter Length Approximately 30 feet

Invert Elevations: Entrance 1182 Exit 1181.5 (as designed)

Physical Condition (Describe): Not observable.

Material: --

Joints: -- Alignment --

Structural Integrity: --

Hydraulic Capability: --

Means of Control: Gate X Valve \_\_\_\_\_ Uncontrolled \_\_\_\_\_

Operation: Operable X Inoperable \_\_\_\_\_ Other \_\_\_\_\_

Present Condition (Describe): The reservoir drain pipe  
is reported to be operable.

9) Structural

a. Concrete Surfaces The concrete riser and the concrete  
outlet structure appears to be in good condition.

b. Structural Cracking None

c. Movement - Horizontal & Vertical Alignment (Settlement)

No problems observed.

d. Junctions with Abutments or Embankments

No problems observed.

e. Drains - Foundation, Joint, Face

No problems observed.

f. Water Passages, Conduits, Sluices

N/A

g. Seepage or Leakage

No problems observed.

- h. Joints - Construction, etc. N/A
- i. Foundation No problems observed.
- j. Abutments No problems observed.
- k. Control Gates Condition unknown.
- l. Approach & Outlet Channels Good
- m. Energy Dissipators (Plunge Pool, etc.) Good condition.
- n. Intake Structures Good
- o. Stability N/A
- p. Miscellaneous ---

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition None

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

APPENDIX C  
ENGINEERING DATA CHECKLIST

APPENDIX C  
ENGINEERING DATA CHECKLIST  
NAME OF DAM: NANTICOKE CREEK WATERSHED PROJECT -  
FLOODWATER RETARDING DAM SITE 9-C

AREA-CAPACITY DATA:

	<u>Elevation</u> (feet)	<u>Surface Area</u> (acres)	<u>Storage Capacity</u> <sup>(1)</sup> (acre-feet)
1) Top of Dam	<u>1211.3</u>	<u>69.7</u>	<u>899</u>
2) Design High Water (Max. Design Pool)	<u>1209.8</u>	<u>65.7</u>	<u>798</u>
3) Auxiliary Spillway Crest	<u>1206.0</u>	<u>55.8</u>	<u>567</u>
4) Primary Spillway Crest	<u>1197.8</u>	<u>36.1</u>	<u>193</u>
5) Crest of Orifice (Normal Pool)	<u>1189.6</u>	<u>13.0</u>	<u>0</u>

(1) Storage capacity below normal pool is not included.

DISCHARGES

	<u>Discharge</u> (cfs)
1) Average Daily	<u>7<sup>+</sup></u>
2) Auxiliary Spillway at Maximum High Water (Top of Dam)	<u>8281</u>
3) Auxiliary Spillway at Design High Water	<u>8281<sup>+</sup></u>
4) Principal Spillway at Dam Crest Elevation	<u>193</u>
5) Low Level Outlet	<u>20<sup>+</sup></u>
6) Total of All Facilities at Maximum High Water	<u>8494</u>
7) Maximum Known Flood	<u>Unknown</u>
8) At Time of Inspection	<u>Approx. 7<sup>+</sup></u>



DAM: Nanticoke Creek Watershed Project-Floodwater Retarding Dam Site 9-C

CREST ELEVATION: 1211.3

Type: Earth

Top Width: 14 feet Length: 870 feet

Spillover: Concrete riser and two vegetated earth channels.

Location: Concrete riser near the center of the dam, earth channel on each abutment.

SPILLWAY:

SERVICE		AUXILIARY (Two Units)
Orifice at 1189.6, weir at 1197.8	Elevation	<u>1206.0</u>
SCS concrete drop inlet	Type	<u>Vegetated channel</u>
2'-2" x 2' orifice and 18' weir	Width	<u>100 feet (each unit)</u>
	Type of Control	
<u>Uncontrolled</u>	Uncontrolled	<u>Uncontrolled</u>
	Controlled	
<u>N/A</u>	Type (Flashboards; Gate)	<u>N/A</u>
<u>N/A</u>	Number	<u>N/A</u>
<u>N/A</u>	Size/Length	<u>100 feet</u>
	Invert Material	<u>Vegetated Earth</u>
	Anticipated Length of Operating Service	<u>Unknown</u>
<u>150<sup>±</sup> feet</u>	Chute Length	<u>N/A</u>
<u>1 foot <sup>±</sup> for orifice; 8 feet <sup>±</sup> for weir</u>	Height Between Spillway Crest and Approach Channel Invert (Weir Flow)	<u>8<sup>±</sup> feet</u>

Hydrometeorological Gages:

Type: None

Location: N/A

Records:

Date - N/A

Max. Reading - N/A

FLOODWATER CONTROL SYSTEM:

Warning System: None

Method of Controlled Releases (Mechanisms):

None

DRAINAGE AREA: 4.36 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Wood and farmland

Terrain - Relief: Moderate slope

Surface - Soil: Low permeability soil

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Moderate to high runoff potential (SCS Hydrological Curve  
No. (CN) 78 was used in the original design calculation).

Potential Sedimentation Problem Areas (natural or man-made;  
present or future)

None observed.

Potential Backwater Problem Areas for Levels at Maximum Storage  
Capacity Including Surge Storage:

None observed.

Dikes - Floodwalls (overflow and nonoverflow) - Low Reaches Along  
the Reservoir Perimeter:

Location: None

Elevation: \_\_\_\_\_

Reservoir:

Length at Maximum Pool: 3,000 feet; at normal pool 400 feet

Length of Shoreline at Normal Pool: 4,000 feet

APPENDIX D  
HYDROLOGY AND HYDRAULIC ANALYSES

HYDROLOGY AND HYDRAULIC ANALYSIS  
DATA BASE

NAME OF DAM: Nanticoke Creek Watershed Project-Floodwater Retarding Dam Site 9-C (NY DEC 85D-3443)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 INCHES/24 HOURS<sup>(1)</sup>

STATION	1	2	3	4	5
Station Description	9-C Lake	9-C Dam			
Drainage Area (square miles)	4.36				
Cumulative Drainage Area (square miles)	4.36	4.36			
Adjustment of PMF for Drainage Area (%)	94 <sup>(2)</sup>				
6 Hours	117 <sup>(2)</sup>	-			
12 Hours	127	-			
24 Hours	136	-			
48 Hours	142	-			
72 Hours	145	-			
Snyder Hydrograph Parameters					
$C_p, C_t$ (3)	0.62/1.8	-			
$L$ (miles) <sup>(4)</sup>	3.28	-			
$L_{ca}$ (miles) <sup>(4)</sup>	1.55	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	2.92	-			
Spillway Data					
Crest Length (ft)	-	See spillway capacity rating calculations			
Freeboard (ft)	-				
Discharge Coefficient	-				
Exponent	-				

<sup>(1)</sup> Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

<sup>(2)</sup> Hydrometeorological Report 40, U. S. Weather Bureau, 1965.

<sup>(3)</sup> Snyder's Coefficients ( $C_p$  and  $C_t$ ) as recommended by Corps of Engineers, Baltimore District, for Susquehanna River Basin.

<sup>(4)</sup>  $L$  = Length of longest water course from outlet to basin divide.

$L_{ca}$  = Length of water course from outlet to point opposite the centroid of drainage area.

.....  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 01 APR 80  
 .....

1	A1	SNYDER UNIT HYDROGRAPH, SPILLWAY AND DAM OVERTOPPING ANALYSES							
2	A2	NANTICOKE 9-C DAM (N.Y. 850-3443) BROOME COUNTY, N.Y. PROJECT NO. 80-774-06							
3	A3	FOR 20% 30% 40% 50% 60% 70% 80% 90% AND 100% PROBABLE MAXIMUM FLOOD (HEC-1)							
4	B	300.	0	15	0	0	0	0	-4
5	B1	5							0
6	J	1	9	1					
7	J1	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
8	K	0	1						1.00
9	K1								
10	M	1	4.36	4.36					
11	P	1	20.9	117	127	136	142	145	
12	T							1.0	0.05
13	U	2.92	0.62						0.0047
14	X	-1.5	-0.05	2.0					
15	K	1	2						
16	K1								
17	Y								
18	Y1	1							
19	Y41189.6	1190.0	1191.0	1192.7	1194.0	1197.8	1198.5	1198.5	1199.15
20	Y41202.0	1204.0	1206.0	1206.5	1207.0	1207.5	1208.0	1209.0	1210.0
21	Y5	0.0	1.7	11.1	36.8	43.8	59.7	65.5	94.7
22	Y5	162.9	169.8	176.5	398.5	806.8	1347.5	1994.6	5574.0
23	SA	13.0	36.1	55.8	65.7	69.7			
24	SE1184.6	1197.8	1206.0	1209.8	1211.3				
25	SE1197.8								
26	SD1211.3	2.65	1.5	870.0					
27	K								

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS									
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9	RATIO 10
HYDROGRAPH AT	1	4.36	1	1758.	2637.	3516.	4395.	5274.	6152.	7131.	7910.	8789.	
	(	11.29)	(	49.78)	( 74.66)	( 99.55)	( 124.44)	( 149.33)	( 174.22)	( 199.11)	( 223.99)	( 248.88)	
ROUTED TO	2	4.36	1	919.	2182.	3262.	4241.	5141.	6032.	6902.	7766.	8654.	
	(	11.29)	(	26.03)	( 61.79)	( 92.38)	( 120.10)	( 145.58)	( 170.81)	( 195.66)	( 219.97)	( 245.05)	

# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 1189.60 0. 0.	SPILLWAY CREST 1197.80 193. 60.	TOP OF DAM 1211.30 899. 8474.						
RATIO OF PHF	MAXIMUM RESERVOIR W-S-ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS			
.20	1207.10	0.00	630.	919.	0.00	45.50	0.00			
.30	1208.12	0.00	691.	2182.	0.00	43.75	0.00			
.40	1208.80	0.00	734.	3262.	0.00	43.25	0.00			
.50	1209.35	0.00	768.	4241.	0.00	43.00	0.00			
.55	1209.81	0.00	799.	5141.	0.00	43.00	0.00			
.70	1210.23	0.00	827.	6032.	0.00	43.00	0.00			
.80	1210.61	0.00	852.	6902.	0.00	43.00	0.00			
.90	1210.99	0.00	878.	7766.	0.00	43.00	0.00			
1.00	1211.36	.06	904.	8654.	1.00	42.75	0.00			

OVERTOPPING ANALYSIS SUMMARY

PAGE D4 OF 7



# D'APPOLONIA

CONSULTING ENGINEERS, INC.

By WTC Date 6/6/81 Subject NANTICOKE CREEK DAM SITE 9-C Sheet No. 1 of 3  
Chkd. By MS Date 6/8/81 HYDRAULIC CALCULATIONS Proj. No. 80-778

## SPILLWAY CAPACITY RATING

- a) SCS RISER, ORIFICE OPENING 2'-2" Wide X 2'-0" High @ EL 1189.6  
Weir 9' each side L=18' @ EL 1197.8  
b) EMERGENCY SPILLWAY TWO TRAP CHANNEL, b=100', AVG slope 2.75H to 1V @ EL 1206

1) When Water level EL 1189.6 < h < 1197.8  
Weir Flow Thru. ORIFICE  $Q_1 = C \cdot L \cdot h^{1.5} = (3.1)(18)(h)^{1.5}$   
 $Q_1 = 6.72 h^{1.5}$  ..... EQ-1

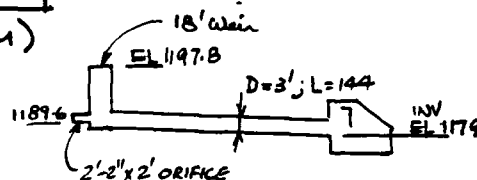
ORIFICE Flow Thru. ORIFICE  $Q_2 = C \cdot A \sqrt{2gh} = (0.6)(2 \times 2.17)(\sqrt{64.4})\sqrt{h}$   
 $Q_2 = 20.86 \sqrt{h}$  ..... EQ-2

2) When Water level above EL 1197.8 < H < 1206, ADDED CAPACITY  
Weir Flow Thru RISER  $Q_3 = (3.1)(18) H^{1.5}$   
 $Q_3 = 55.8 H^{1.5}$  ..... EQ-3

PIPE FLOW (P. 567 DESIGN OF SMALL DAM)

$$H_T = \left[ \frac{(25204)(1+K_e)}{D^4} + \frac{46618 n^2 L}{D^{16/3}} \right] \left( \frac{Q_4}{10} \right)^2$$

$$= \left[ \frac{(25204)(1.9)}{3^4} + \frac{(46618)(0.012)^2 (144)}{(3)^{16/3}} \right] \left( \frac{Q_4}{10} \right)^2$$



$$Q_4 = 33.96 \sqrt{H_T}$$
 ..... EQ-4

3) When Water level ABOVE EL 1206

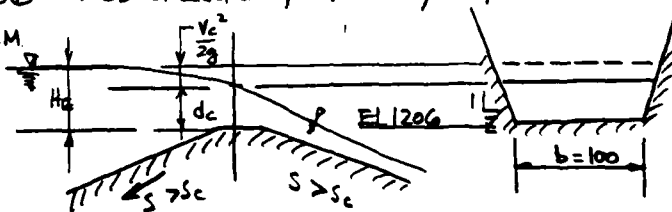
ADD EMERGENCY SPILLWAY CAPACITY

REF: P. 553 DESIGN OF SMALL DAM

$$V_c = \sqrt{\frac{b + 2Z d_c}{b + 2Z d_c} d_c g}$$
 EQ-5

$$H_E = d_c + \frac{V_c^2}{2g} = d_c + \frac{b + 2Z d_c}{b + 2Z d_c} (d_c g) \frac{1}{2g}$$

$$= \frac{(3b + 5Z d_c) d_c}{2b + 4Z d_c}$$



$$d_c = \frac{-(3b - 4HEZ) + \sqrt{(3b - 4HEZ)^2 + (4HEZ)(10b)}}{10Z}$$
 ..... EQ-6

$$A_c = (Z d_c + b) d_c$$
 ..... EQ-7

$$Q_c = (A_c) (V_c)$$
 ..... EQ-8

$$Q_5 = 2 Q_c = 2 A_c V_c$$
 ..... EQ-9

# D'APPOLONIA

CONSULTING ENGINEERS, INC.

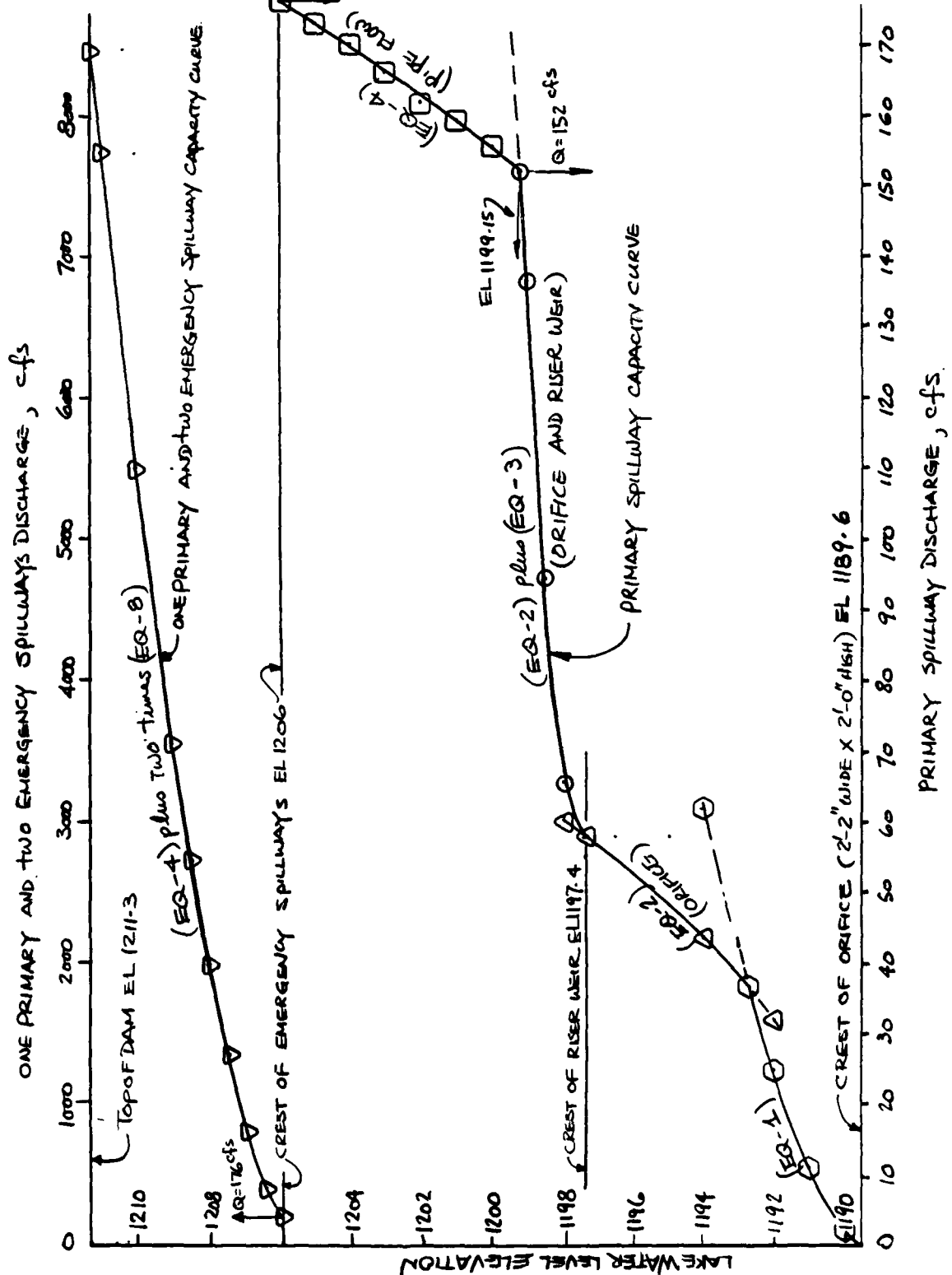
By WTC Date 6/7/81 Subject NANTICOKE CREEK DAM SITE 9-C Sheet No. 2 of 3  
Chkd. By MS Date 6/8/81 HYDRAULIC CALCULATIONS Proj. No. 80-778

LAKE ELEVATION (USGS)	PRIMARY SPILLWAY				PRIMARY SPILLWAY CAPACITY $Q_p$ $(Q_1 + Q_2 + Q_3 + Q_4)$	EMERGENCY SPILLWAY			EM. SPILL- CAPACITY $Q_c$	COMBINED SPILLWAY CAPACITY $Q_p + 2Q_c$
	ORIFICE		RISER			$EQ-6$ $d_c$	$EQ-7$ $A_c$	$EQ-5$ $V_c$		
	$EQ-1$	$EQ-2$	$EQ-3$	$EQ-4$						
	$Q_1$	$Q_2$	$Q_3$	$Q_4$						
FT	cfs	cfs	cfs	cfs	cfs	FT	FT <sup>2</sup>	fps	cfs	cfs
1189.6	0				0					0
1190	1.7	<del>13.2</del>			1.7					1.7
1190.5	5.7	<del>19.8</del>			5.7					5.7
1191	11.1	<del>24.7</del>			11.1					11.1
1192	25.0	<del>32.3</del>			25.0					25.0
1192.7	36.8	36.8			36.8					36.8
1194	<del>62.0</del>	43.8			43.8					43.8
1197.4	<del>146.3</del>	58.3	0		58.3					58.3
1198		60.5	5.0	<del>148.0</del>	65.5					65.5
1198.5		62.2	32.5	<del>150.0</del>	94.7					94.7
1199		64.0	73.4	<del>151.9</del>	137.4					137.4
1199.5		64.5	87.5	<del>152.4</del>	152.0					152.0
1200		<del>67.5</del>	<del>182.1</del>	155.6	155.6					155.6
1201		<del>70.4</del>	<del>319.4</del>	159.3	159.3					159.3
1202				162.9	162.9					162.9
1203				166.4	166.4					166.4
1204				169.8	169.8					169.8
1205				173.2	173.2					173.2
1206				176.5	176.5	0	0	0	0	176.5
1206.5				178.1	178.1	0.3	33.7	3.3	110.2	398.5
1207				179.7	179.7	0.7	68.3	4.6	314.6	808.8
1207.5				181.3	181.3	1.0	103.7	5.6	583.1	1347.5
1208				182.9	182.9	1.3	139.9	6.5	905.9	1994.6
1208.5				184.5	184.5	1.7	176.9	7.2	1277.3	2739.1
1209				186.0	186.0	2.0	214.8	7.9	1694.0	3574.0
1210				189.1	189.1	2.7	293.0	9.1	2654.3	5497.7
1211				192.1	192.1	3.4	374.6	10.1	3774.3	7740.7
1211.3				193.0	193.0	3.6	399.7	10.4	4140.3	8473.6

# D'APPOLONIA

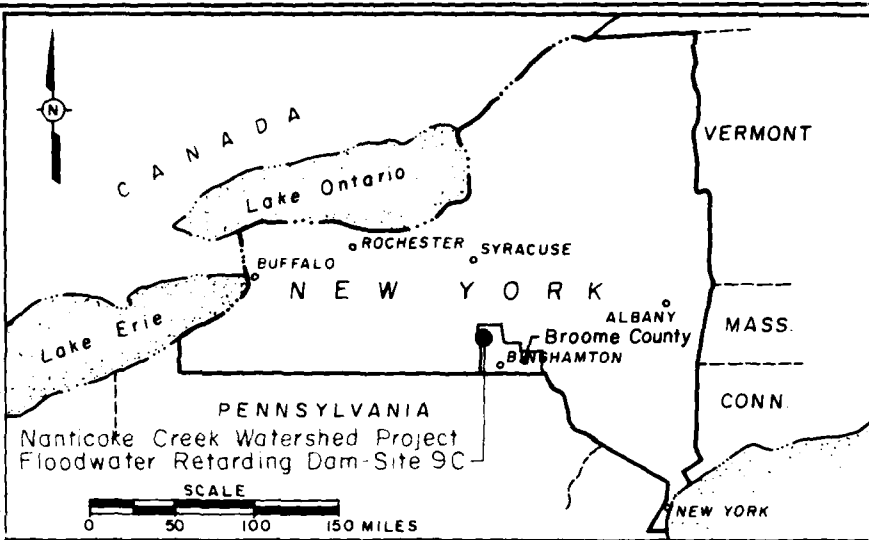
CONSULTING ENGINEERS, INC.

By WTC Date 6/7/81 Subject NANTICOKE CREEK DAM SITE 9C Sheet No. 3 of 3  
 Chkd. By MS Date 6/8/81 HYDRAULIC CALCULATION Proj. No. 80-778

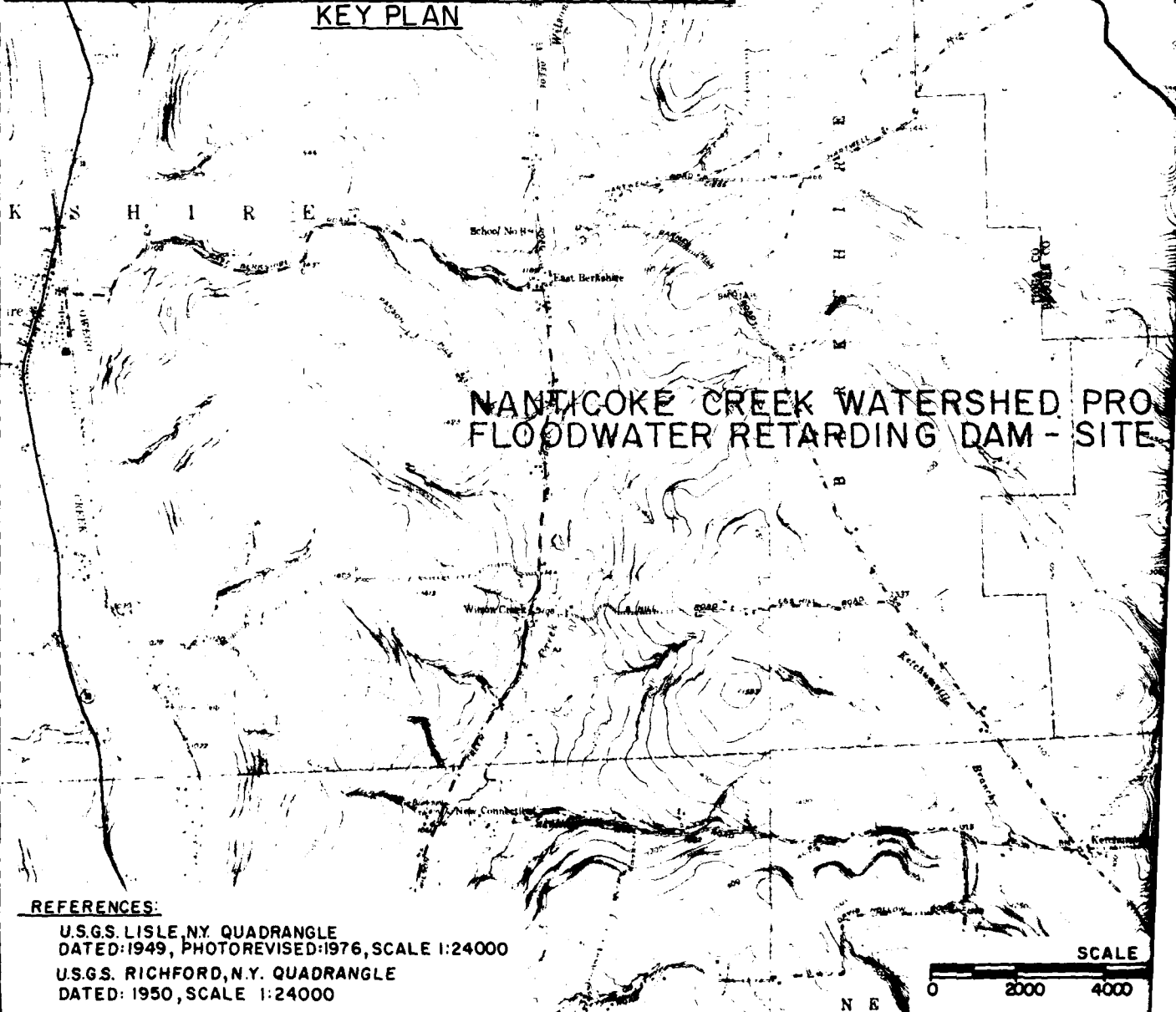


APPENDIX E  
PLATES

DRAWN BY  
A.C.S.  
6-8-81  
CHECKED BY  
JHE  
6/16/81  
APPROVED BY  
JMP  
6/16/81  
DRAWING NUMBER  
80-778-B27



### KEY PLAN



#### REFERENCES:

U.S.G.S. LISLE, N.Y. QUADRANGLE  
DATED: 1949, PHOTOREVISED: 1976, SCALE 1:24000  
U.S.G.S. RICHFORD, N.Y. QUADRANGLE  
DATED: 1950, SCALE 1:24000

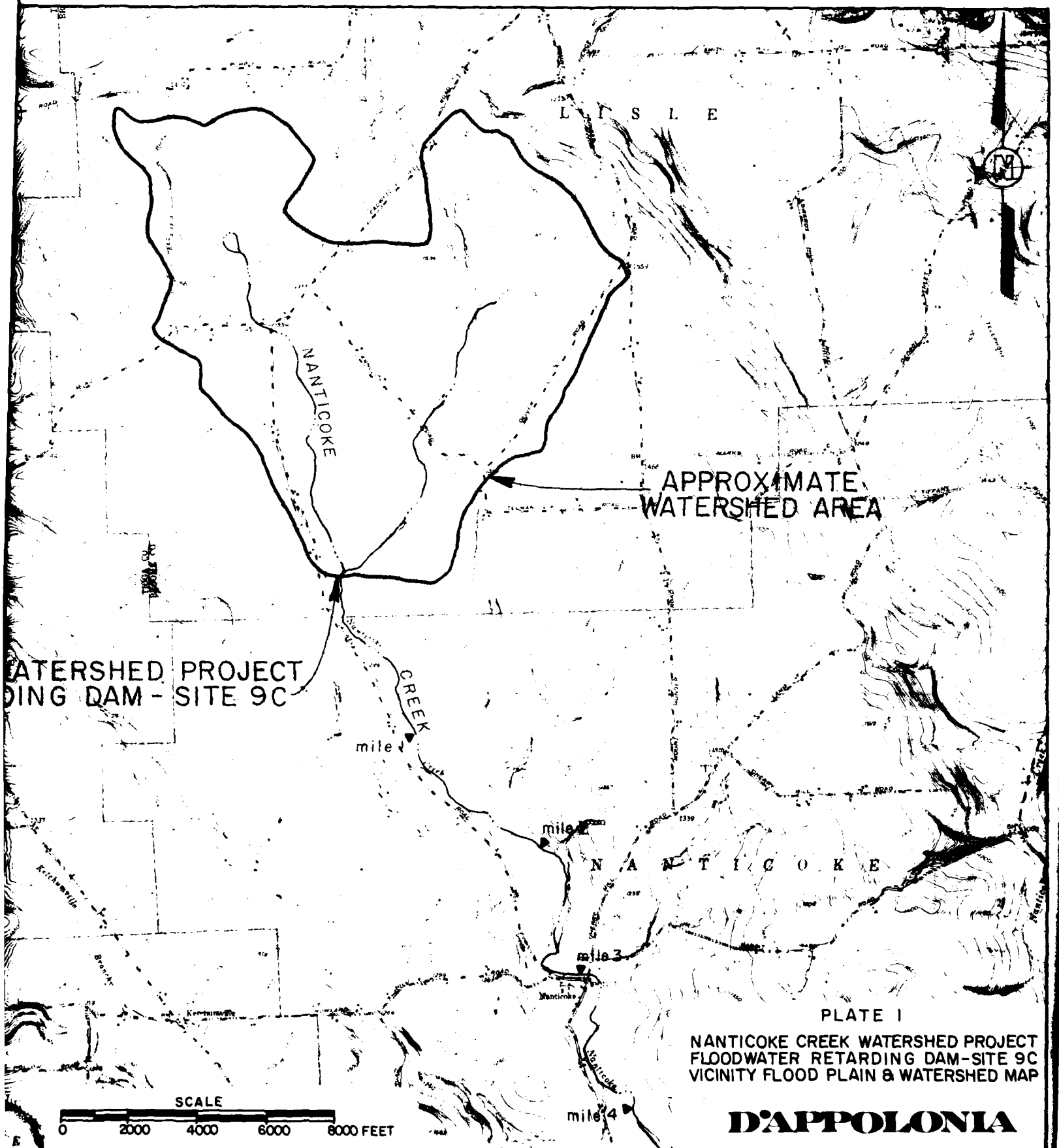


PLATE I  
NANTICOKE CREEK WATERSHED PROJECT  
FLOODWATER RETARDING DAM-SITE 9C  
VICINITY FLOOD PLAIN & WATERSHED MAP

**D'APPOLONIA**

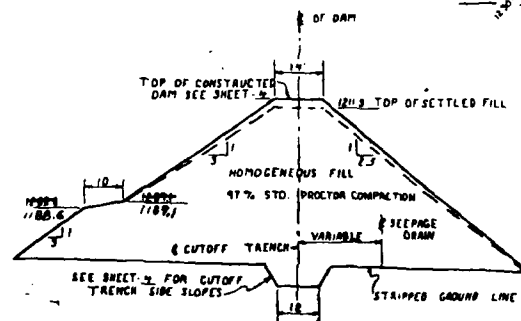
DRAWN BY G.J.G. CHECKED BY G.J.G. APPROVED BY G.J.G.  
 5-26-81 DRAWING 80-778-B29 NUMBER 1/16/81

LAYOUT DATA - CURVE IV				
	STATION	DEFLECTION	CHORD DIST	DIST FROM PC
A	27.20	3.80	PC	
R	200	4.30	7.10	41.9
D	28.39	4.80	14.10	99.9
L	200.1	5.30	21.30	174.6
T	101.4	5.80	28.40	192.0
E	28.0			
M	24.6			

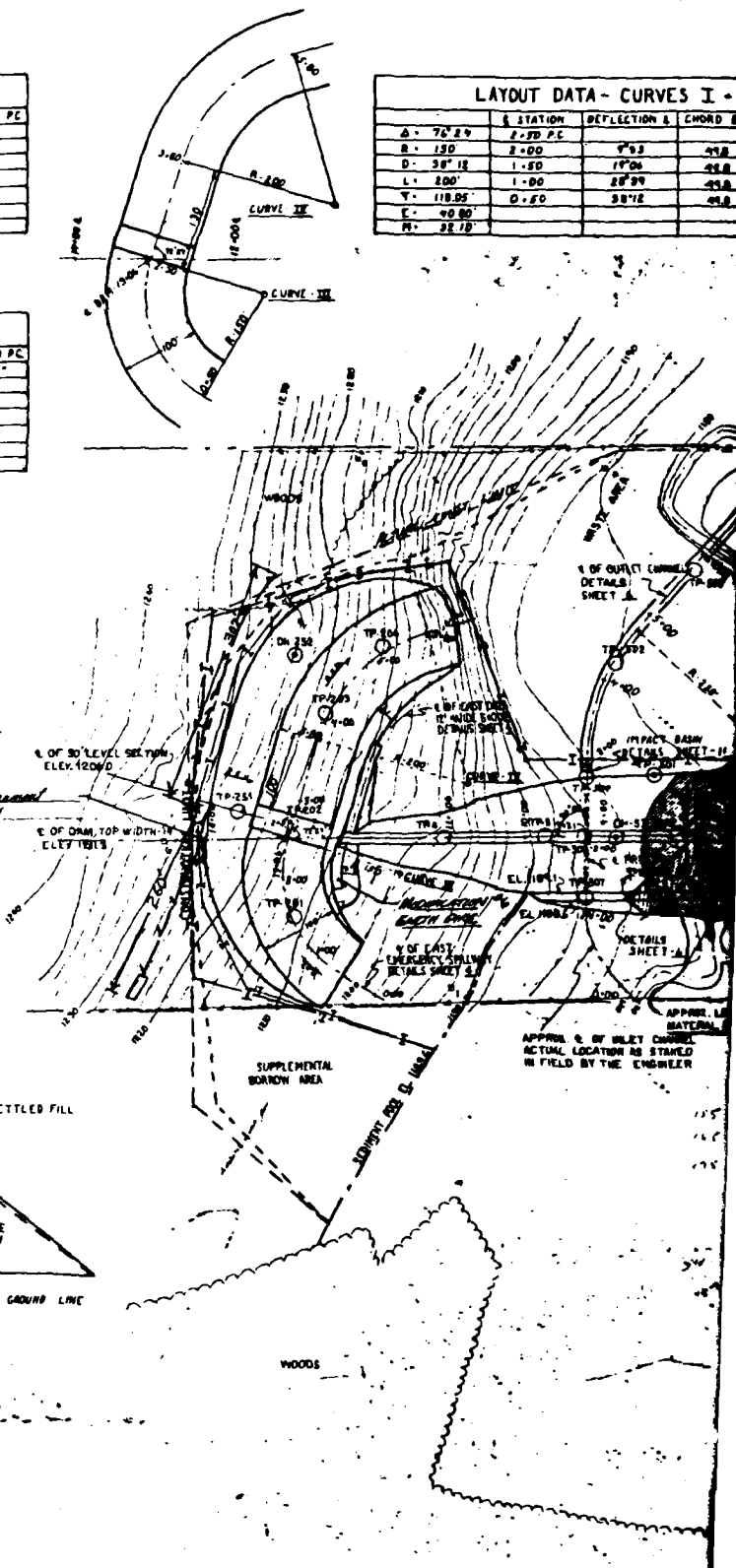
LAYOUT DATA - CURVE V				
	STATION	DEFLECTION	CHORD DIST	DIST FROM PC
A	28.06	3.00	PC	
R	200	3.50	6.01	41.9
D	29.09	4.00	12.02	99.9
L	174.9	4.50	18.03	177.5
T	91.3	4.75	24.03	170.9
E	17.19			
M	12.95			

LAYOUT DATA - CURVES I & II				
	STATION	DEFLECTION	CHORD DIST	DIST FROM PC
A	76.24	2.00	PC	
R	150	2.00	7.53	41.9
D	38.18	1.50	17.06	99.9
L	200	1.00	28.99	174.6
T	118.05	0.50	38.18	192.0
E	40.00			
M	32.10			

- LEGEND**
- SEDIMENT POOL
  - C. OF STREAM
  - FENCELINE
  - CONTOUR LINES
  - PROPERTY LINES (APPROX)
  - CONSTRUCTION LIMIT
  - WOODS LINE
  - TRAVERSE LINE STATIONS
  - BUILDINGS
  - TEST HOLES DRILLED
  - TEST HOLES DRUG
  - NEW FENCE



TYPICAL SECTION OF DAM  
 NOT TO SCALE

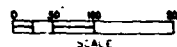
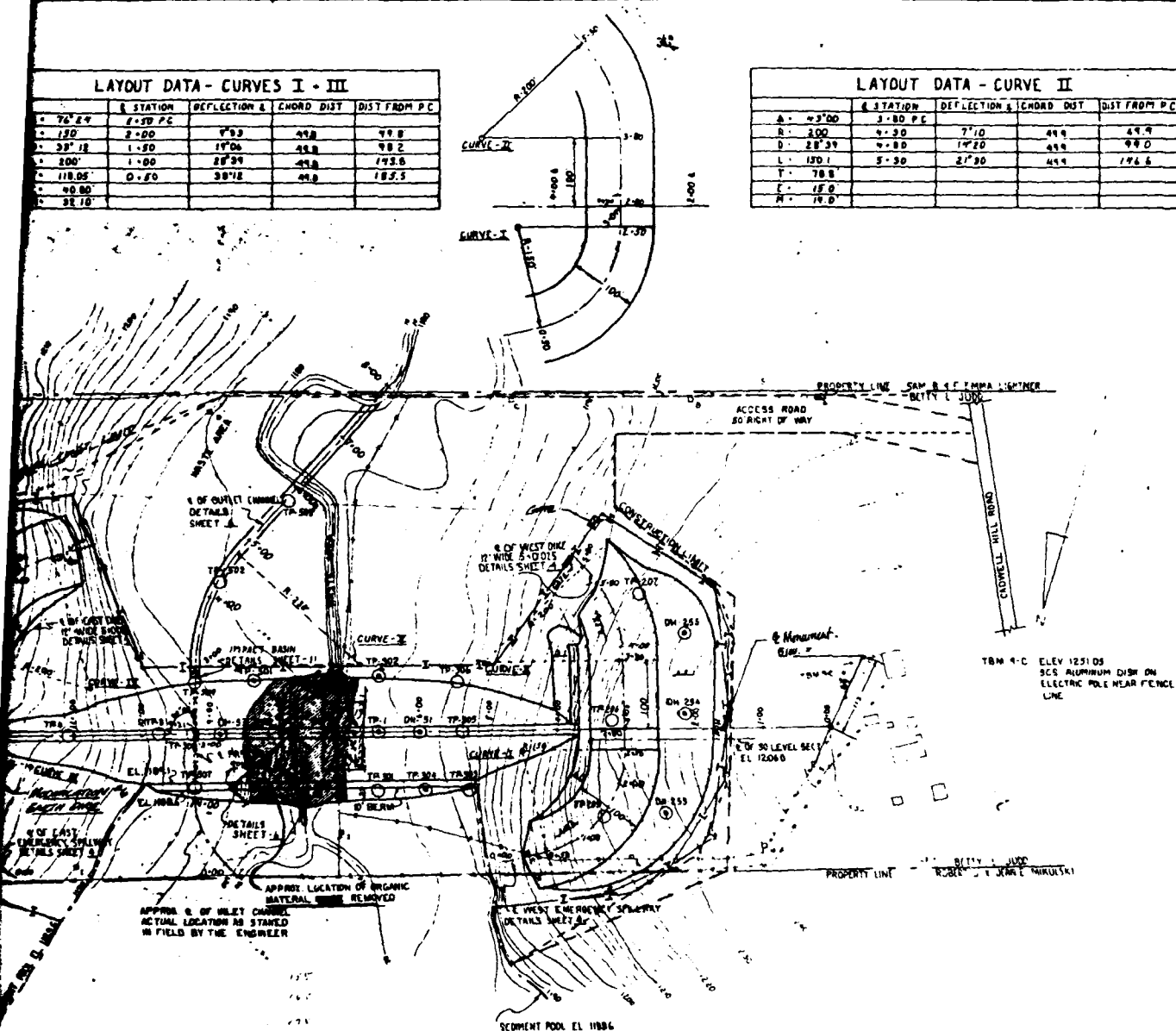


LAYOUT DATA - CURVES I - III

	STATION	DEFLECTION &	CHORD DIST	DIST FROM P.C.
1	76.24	8.30 P.C.		
2	120	2.00	7.93	49.8
3	38.12	1.50	17.06	49.8
4	200	1.00	28.94	49.8
5	118.05	0.50	38.12	49.8
6	40.80			
7	32.10			

LAYOUT DATA - CURVE II

	STATION	DEFLECTION &	CHORD DIST	DIST FROM P.C.
A	43.00	3.00 P.C.		
B	200	4.00	7.10	49.8
C	28.39	4.00	14.20	49.8
D	150.1	5.00	21.30	49.8
E	78.8			
F	15.0			
G	19.0			



NANTICOKE CREEK WATERSHED PROJECT  
 SITE 9-C  
 FLOODWATER RETARDING DAM  
 BROOME COUNTY, NEW YORK  
 DAMSITE  
 U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE

JH HARRINGTON 1/64  
 W YOLTON 11/64  
 JL HUER 1/64  
 L.R. 5/65 NY-2008-P

PIATE 2

D'APPOLONIA

THIS PAGE IS BEST QUALITY PRINTING  
 FROM COPY FURNISHED TO DDC



**BACKSIDE PIT LOGS**

**TP 1, C/A Elev. 1183.9**

- 0 1 Topsoil
- 1 3 Silt - quite pure (approx. 15% - 200 size) - some weak bedding noted in test pit - mottled brown & gray - moist - slowly permeable - recent alluvium - stiff to very stiff. (M) D.S. 1.2 B
- 3 4 Gravel - silty - max. size about 1" - sub-rounded - grayish brown - wet - med. to high permeability - recent alluvium - dense. (M)
- 4 4.5 Silt, sandy (approx. 35% - 200 size) - blue gray - saturated - slowly permeable - Binghamton drift (Wisconsin) - possibly lacustrine - stiff to very stiff. (M) D.S. 1.3 B
- 4.5 13 Silt - quite pure (approx. 10% - 200 size) (some weak bedding noted in test pit side) - brownish gray - saturated - slowly permeable - Binghamton drift (Wisconsin) (lacustrine) - stiff to very stiff. D.S. 1.4 B (M)

**TP 2, C/A Elev. 1183.8**

- 0 3 Silt - quite pure (20% - 200 size) - brown - dry to moist - slowly permeable - recent alluvium - stiff. (M)
- 3 5 Silt - some sand - considerable amount of organic material (buried roots, etc.) - blue gray - wet to saturated - slowly permeable - Binghamton drift, Wisconsin (lacustrine) - soft. (M)
- 5 6.5 Gravel - quite clean and well graded - max. size about 1" - mostly subrounded - brown - saturated, with heavy seepage - rapidly permeable - probably Wisconsin outwash - medium density. (M or CM)
- 6.5 11 Gravel - fairly high % of fines (approx. 40%) - typical till texture - grayish brown - saturated - slowly permeable - Wisconsin till (Binghamton drift) very dense - U.S. - 4.0 overnight. (M)

**TP 3, C/A Elev. 1190.0**

- 0 1 Topsoil
- 1 9.5 Gravel - fairly high % of fines (approx. 40%) - typical till texture - grayish brown - saturated - slowly permeable - Wisconsin till (Binghamton drift) very dense - very minor seepage in pit overnight. (M)

**TP 4, C/A Elev. 1202.1**

- 0 1 Topsoil
- 1 10 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. (M)

**TP 501, Rear Elev. 1212.5**

- 0 1 Topsoil
- 1 8 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. (M)

**TP 502, Rear Elev. 1217.2**

- 0 1 Topsoil
- 1 10 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. D.S. 202.1 D (M) CL

**TP 503, Rear Elev. 1218.2**

- 0 1 Topsoil
- 1 12 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. (M)

**TP 504, Rear Elev. 1218.9**

- 0 1 Topsoil
- 1 12 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. D.S. 204.1 (M) CL

**TP 505, Rear Elev. 1220.2**

- 0 1 Topsoil
- 1 11 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - big boulder at 11'. (M) D.S. 205.2, 207.1 CL

**TP 506, Rear Elev. 1224.1**

- 0 1 Topsoil
- 1 13 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. D.S. 204.1 B (M) CL

**TP 507, Rear Elev. 1213.9**

- 0 1 Topsoil
- 1 13 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. D.S. 205.2, 207.1 (M) CL

**TP 508, Front Elev. 1183.8**

- 0 21.5 Topsoil (chocolate brown flood plain silt)
- 2.5 4 Gravel, few fines, medium grain - brown - saturated - rapidly permeable - apparently a buried stream channel - fairly loose - heavy seepage. (M)
- 4 10 Silt, with some fine sand - some bedding visible in side of pit - gray - saturated - slowly permeable - Binghamton drift (Wisconsin) probably lacustrine, although could be a ponded outwash - soft - (pit dug under water, so rather difficult to log accurately.) (M)

**TP 509, Front Elev. 1183.9**

- 0 1 Topsoil
- 1 3 Silt, nearly pure (approx. 15% - 200 size) - no structure noted in pit - light brown - moist - slowly permeable - recent alluvium - medium to stiff. D.S. 202.1 D (M)

- 3 6.5 Silt, nearly pure - some weak bedding noted - brown & gray mottled - moist to sat. at about 5' - slowly permeable - probably lacustrine deposit associated with Binghamton drift - medium to stiff. D.S. 202.1 B (M)
- 6.5 8.5 Silt with about 20% - 200 size - some weak bedding noted - blue gray - slowly permeable - lacustrine - Binghamton - stiff - saturated. D.S. 202.3 B (M)

- 8.5 12 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (M)

**TP 503, Front Elev. 1188.4**

- 0 1 Topsoil
- 1 12 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (M)

**TP 504, Front Elev. 1185.1**

- 0 1 Topsoil
- 1 3.5 Silt, nearly pure - brown & gray mottled - moist - slowly permeable - recent alluvium - medium to stiff. D.S. 204.1 B (M)
- 3.5 4.5 Color change of above to a blue gray. D.S. 204.2 B (M)

- 4.5 5.5 Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (M)

- 5.5 7.5 Sand, some silt - brownish gray - wet - med. permeable - Binghamton outwash - stiff. (M)

- 7.5 12 Silt, some fine sand (approx. 12% - 200) with occasional coarse containing fine gravel - brown - sat. - slowly permeable - Binghamton drift - lacustrine - medium to stiff. D.S. 204.3 (M)

**TP 505, Front Elev. 1189.5**

- 0 1 Topsoil
- 1 11.5 Gravel - well graded & fairly high % of fines (approx. 40%) - typical texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - changes at 6.5' to a sandier, till that digs a little easier. 10' it becomes quite wet with a amount of seepage at bottom of.

**TP 506, Front Elev. 1187.4**

- 0 1 Topsoil
- 1 12 Gravel - well graded & fairly high % of fines (approx. 40%) - typical texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - changes at 6.5' to a sandier, till that digs a little easier. 10' it becomes quite wet with a amount of seepage at bottom of.

**TP 507, Front Elev. 1185.7**

- 0 1 Topsoil
- 1 7 Gravel - well graded & fairly high % of fines (approx. 40%) - typical texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense.

**TP 508, Front Elev. 1185.9**

- 0 1 Topsoil
- 1 7 Gravel - well graded & fairly high % of fines (approx. 40%) - typical texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense.

**TP 509, Front Elev. 1184.7**

- 0 1 Topsoil
- 1 7 Gravel - well graded & fairly high % of fines (approx. 40%) - typical texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense.

**TP 501, D.S. Two, Elev. 1183.4**

- 0 1 Topsoil
- 1 3 Silt - quite pure - brown - med. slowly permeable - recent alluvium - soft.
- 3 6 Gravel - medium grain - quite gray - saturated w/seepage - permeable - buried stream channel - water level at 4.5' of D.S. 204.1

- 6 10 Gravel - well graded & fairly high % of fines (approx. 40%) - typical texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense.

**TP 502, East Channel, Elev. 1218.9**

- 0 1 Topsoil
- 1 5 Silt - mottled brown & gray - slowly permeable - recent alluvium - stiff to very stiff.
- 5 7 Silt - some trace of organic - wet to saturated - slowly permeable - Binghamton drift - lacustrine outwash - soft.

**TP 503, East Channel, Elev. 1217.7**

- 0 2 Topsoil & chocolate brown silt
- 2 6 Silt - some trace of organic - wet to saturated - slowly permeable - Binghamton drift - lacustrine outwash - soft.

TP 325, Prim. Elev. 1189.5

0 1 Topsoil  
1 11.5 Gravel - well graded & fairly high in fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - changes at 6.0' to a sandier, water till that dips a little earlier - at 10' it becomes quite wet with a minor amount of escape at bottom of pit. (M)

TP 326, Prim. Elev. 1189.5

0 1 Topsoil  
1 12 Gravel - well graded & fairly high in fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - changes at 6.0' to a sandier, water till that dips a little earlier - at 10' it becomes quite wet with a minor amount of escape at bottom of pit. (M)

TP 327, Prim. Elev. 1189.7

0 1 Topsoil  
1 7 Gravel - well graded & fairly high in fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (M)

TP 328, Prim. Elev. 1189.9

0 1 Topsoil  
1 7 Gravel - well graded & fairly high in fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (M)

TP 329, Prim. Elev. 1189.7

0 1 Topsoil  
1 7 Gravel - well graded & fairly high in fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (M)

TP 502, D.S. No. Elev. 1189.6

0 1 Topsoil  
1 3 Silt - quite pure - brown - moist - slowly permeable - recent alluvium - soft.  
3 6 Gravel - medium grade - quite clean - gray - saturated w/massage - rapidly permeable - buried stream channel - loose - water level at 4.5 overnight. D.S. 502.1 (M)

TP 503, East Channel, Elev. 1189.9

0 1 Topsoil  
1 5 Silt - mottled brown & gray - moist - slowly permeable - recent alluvium - stiff to very stiff. (M)  
5 7 Silt - some trace of organic - blue gray - wet to saturated - slowly permeable - Binghamton drift - lacustrine or ponded outwash - soft. (M)

TP 503, East Channel, Elev. 1189.7

0 8 Topsoil & chocolate brown flood plain silt.  
2 6 Silt - some trace of organic - blue gray - wet to saturated - slowly permeable - Binghamton drift - lacustrine or ponded outwash - soft. (M)

TP 52, Elev. 1189.5

TP 52, C/L Elev. 1189.5

0.0 Silt, some fine sand - brown & gray mottled - moist - slowly permeable - stiff to very stiff - recent alluvium.  
5.0 Silt, mostly pure - blue gray - wet to saturated - slowly permeable - Binghamton drift - alluvium - stiff.  
9.0 Silt, some small gravel - blue gray - wet - slowly permeable - Binghamton, lacustrine - stiff.  
12.9 Silt, some sand - brown - wet - slowly permeable - Binghamton, lacustrine - very stiff.  
13.5 Silt, some sand & small gravel - brown - wet - slowly permeable - Binghamton, lacustrine.  
17.5 Gravel, well graded & fairly high in fines - typical till texture - grayish brown to brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
20.0

TP 52, C/L Elev. 1189.3

0.0 Silt, some organic material - gray - wet to sat. - slowly permeable - recent alluvium & Binghamton, lacustrine - medium.  
5.0 Gravel, sandy - blue gray - sat. - rapidly permeable - buried stream channel - loose.  
6.4 Silt, sandy, occasional stones in lower part of horizon - blue gray grading into brown at about 10' - sat. - slowly permeable - Binghamton, lacustrine - stiff to very stiff.  
12.5 Gravel, well graded & fairly high in fines - typical till texture - grayish brown to brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
20.0

TP 52, C/L Elev. 1189.4

0.0 Silt, some sand - brown - moist - slowly permeable - recent alluvium - stiff to very stiff.  
2.6 Gravel, well graded & fairly high in fines - typical till texture - grayish brown to brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
11.0 Same as above, except sandier.  
12.5 Gravel, well graded & fairly high in fines - typical till texture - gray to brownish gray - sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
18.3 Silt, sandy with few small pebbles - brown - sat. - slowly permeable - Binghamton drift (possibly lacustrine) very stiff.  
20.0

NOTE: Samples 11' to 15'. Stone plugged shoe midway in drives & thereby dislocated & compressed the soil for the balance of the drive, therefore, we had short recovery & higher blow counts.

TP 52, Elev. 1189.2

0.0 Gravel, well graded & fairly high in fines - typical texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
16.5 Same as above, except sandier.  
19.5 Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
25.0

TP 52, Elev. 1189.9

0.0 Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
22.0 Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
27.0 Probable silty fine sand - too soft & wet to recover - (drill core noted).  
28.5 Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
30.0

NOTE: Heavy water loss from 27' to 30'. Water level dropped to 28.5' as soon as water poured in at top of casing was stopped.

TP 52, Elev. 1189.4

0.0 Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
16.9 Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
25.0

TP 52, Elev. 1189.7

0.0 Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
16.5 Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
30.0

TP 52, Elev. 1189.3

0.0 Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
18.0 Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.  
30.0

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW Well graded gravel; gravel-sand mixtures  
GM Silty gravel; gravel-sand-silt mixtures  
SM Silty sand; sand-silt mixtures  
ML Silty, v. fine sand; sandy or clayey silts

SAMPLES

KEY TO DRILL HOLE (M) LOGS

1 - Number of blows required for 1-ft. standard penetration, using 2.0" O.D. split barrel sampler, 140 lb. hammer, and 30" drop. ASTM D 1586.  
9.0 Depth in hole (ft.)  
Unified Soil Classification Symbol

(1) FIELD UNIFIED CLASSIFICATION BY VISUAL INSPECTION IN NOV. 1964  
(2) UNIFIED CLASSIFICATION BY LABORATORY

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Investigation No. 57-5-111-4 Date 4/66  
Project No. 57-5-111-4  
Sheet No. 583 of 14  
NY-2008-G

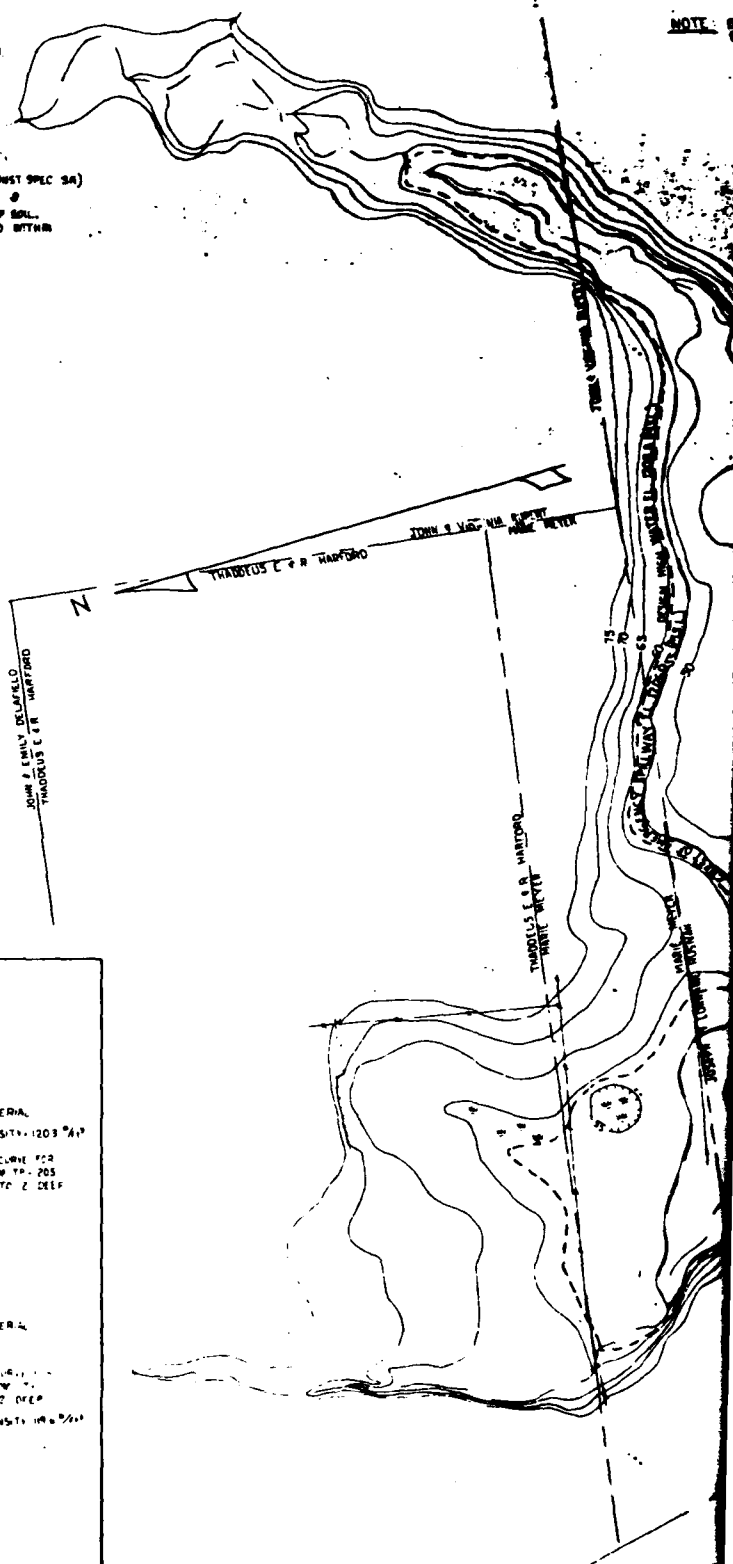
THIS PAGE IS BEST QUALITY PRINTING  
FROM COPY FURNISHED TO ME

2

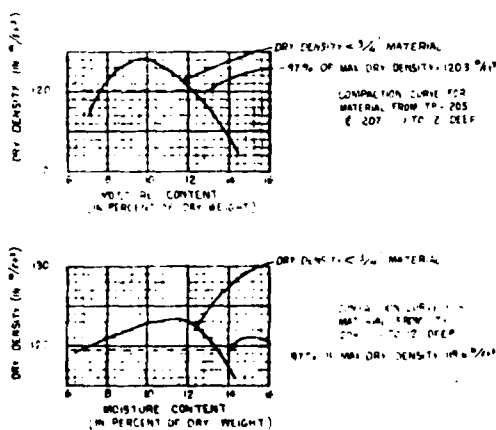
DRAWN BY G.J.G. CHECKED BY J.E. 5-26-81 APPROVED BY J.H.D. 6/6/81 DRAWING 80-778-B28

# GENERAL NOTES

1. ISOLATED CLEANING AND GRUBBING UNDER DAM ALONG STREAM AND IN OUTLET CHANNEL. LIMITS OF AREAS TO BE CLEARED AND GRUBBED SHALL BE AS STATED IN THE FIELD BY THE ENGINEER. (CONST. SPEC. 2A)
2. AREA UPSTREAM FROM DAM AND BELOW ELEV. 1104.6 (W.L.) SHALL BE CLEARED. LIMITS OF AREAS TO BE CLEARED WILL BE STATED IN THE FIELD BY THE ENGINEER. (CONST. SPEC. 1B)
3. AFTER STRIPPING OPERATIONS ARE COMPLETE, REMOVE ORGANIC MATERIAL FROM EMBANKMENT FOUNDATION ADJACENT TO STREAM CHANNEL. LIMITS AND DEPTH OF THIS ELEVATION WILL BE AS DIRECTED BY THE ENGINEER. (CONST. SPEC. 4C)
4. ALL FENCES IN WORK AREA WILL BE REMOVED AS STRUCTURE REMOVAL. (CONST. SPEC. 3A)
5. ALL EARTH FILL SHALL BE CLASS A COMPACTION. (CONST. SPEC. 8)
6. BOTTOM SECTION OF EMERGENCY SPILLING TO BE COVERED WITH 6" OF TOP SOIL.
7. ALL ADDITIONAL TOPSOIL THAT IS SUITABLE FOR USE WILL BE INCORPORATED WITHIN THE SLOPES OF THE EARTH FILL AS DIRECTED BY THE ENGINEER.



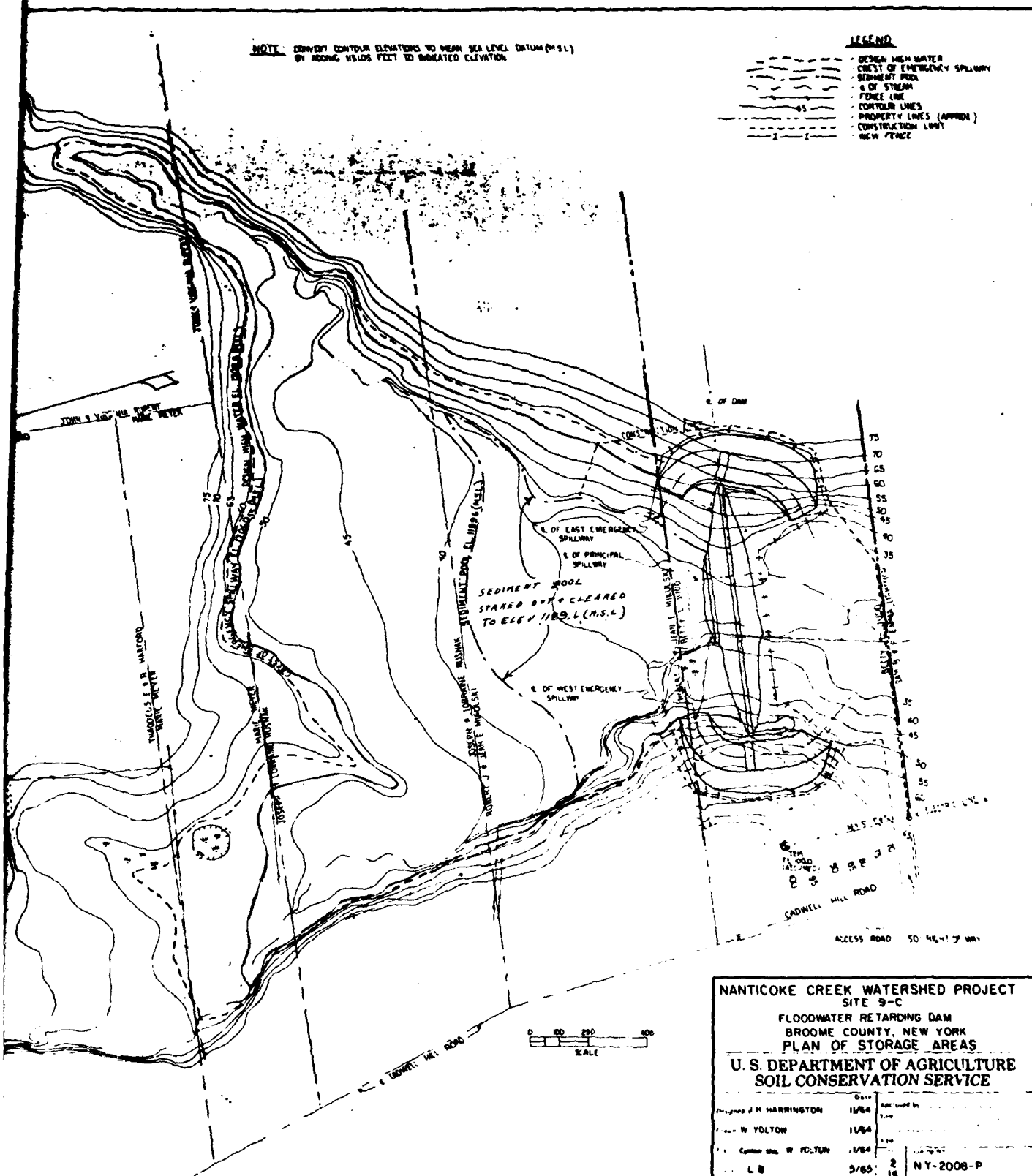
## COMPACTION CURVES



NOTE: CONVERT CONTOUR ELEVATIONS TO MEAN SEA LEVEL DATUM (M.S.L.) BY ADDING 15.105 FEET TO INDICATED ELEVATION

LEGEND

- DESIGN HIGH WATER
- CREST OF EMERGENCY SPILLWAY
- SEDIMENT POOL
- E. OF STREAM
- FENCE LINE
- CONTOUR LINES
- PROPERTY LINES (APPROX)
- CONSTRUCTION LIMIT
- NEW FENCE



NANTICOKE CREEK WATERSHED PROJECT  
 SITE 9-C  
 FLOODWATER RETARDING DAM  
 BROOME COUNTY, NEW YORK  
 PLAN OF STORAGE AREAS  
 U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE

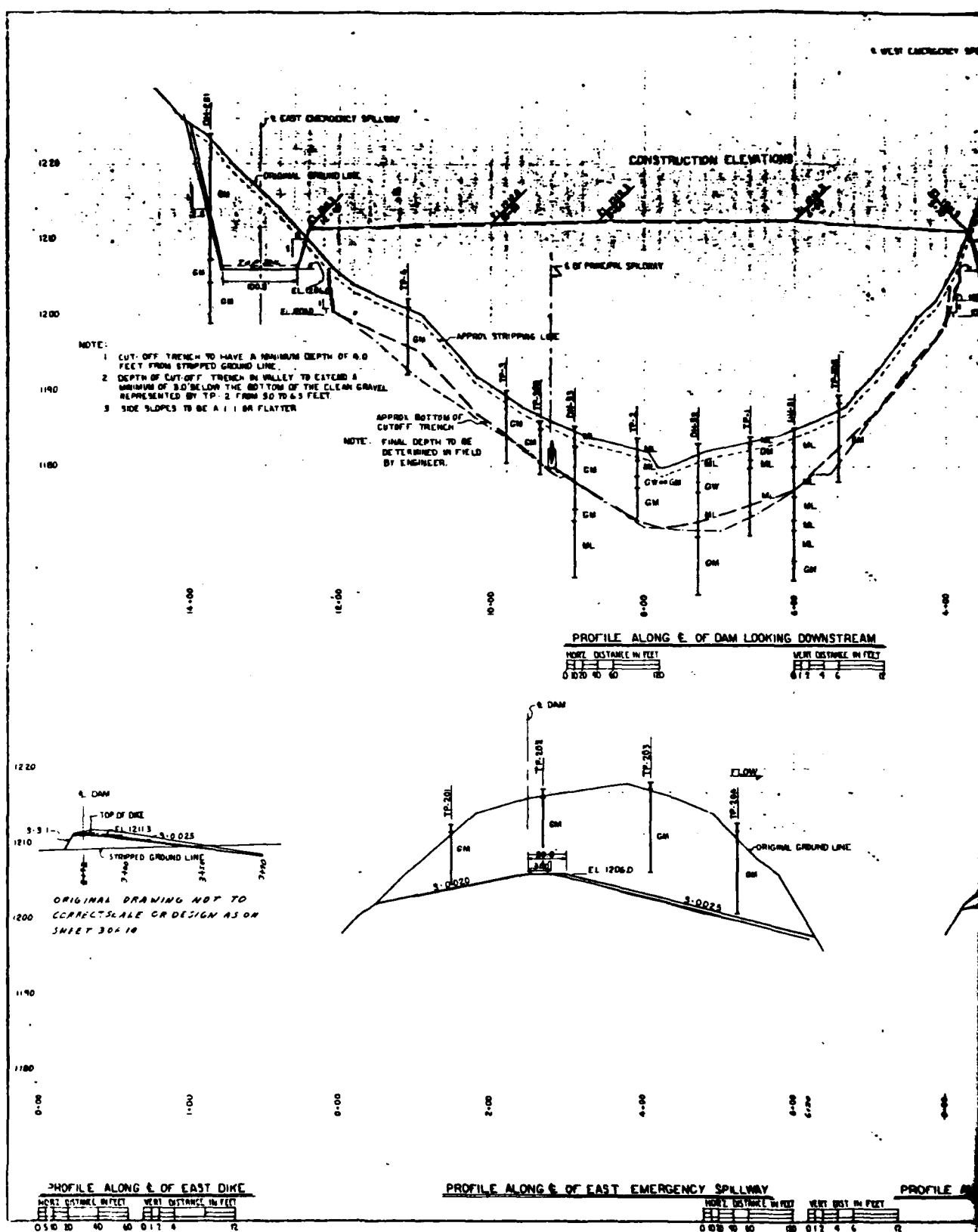
Designed by H. HARRINGTON	Date 11/64	Reviewed by	
Drawn by TOLTON	Date 11/64	Checked by	
Checked by T. TOLTON	Date 1/64	Approved by	
L.B.	5/65	NY-2008-P	

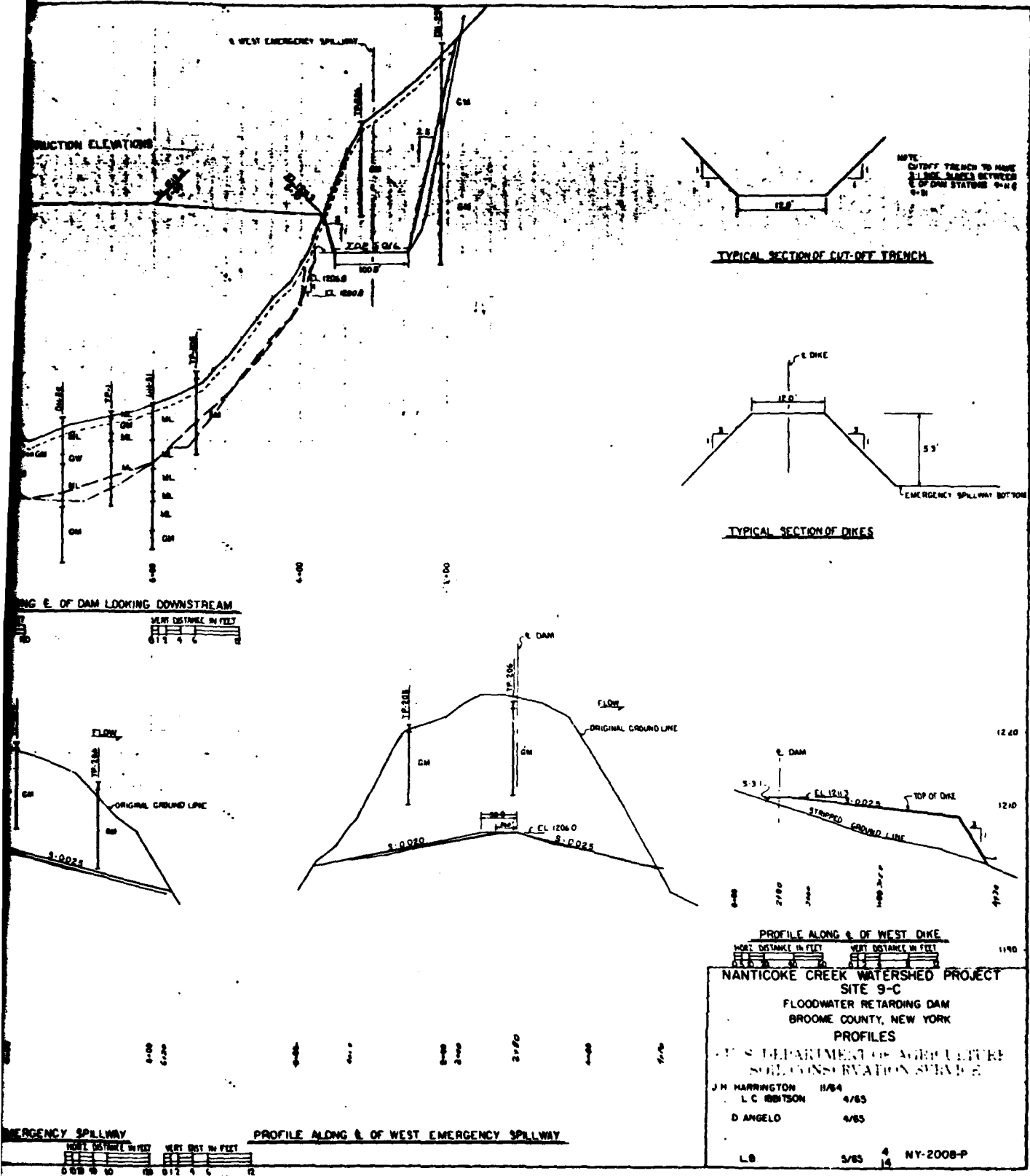
2

PLATE 4

D'APPOLONIA

DRAWN BY G. J. G. CHECKED BY JST 6/16/87 DRAWING 80-778-B30  
 5-26-81 APPROVED BY JHT 6/16/87



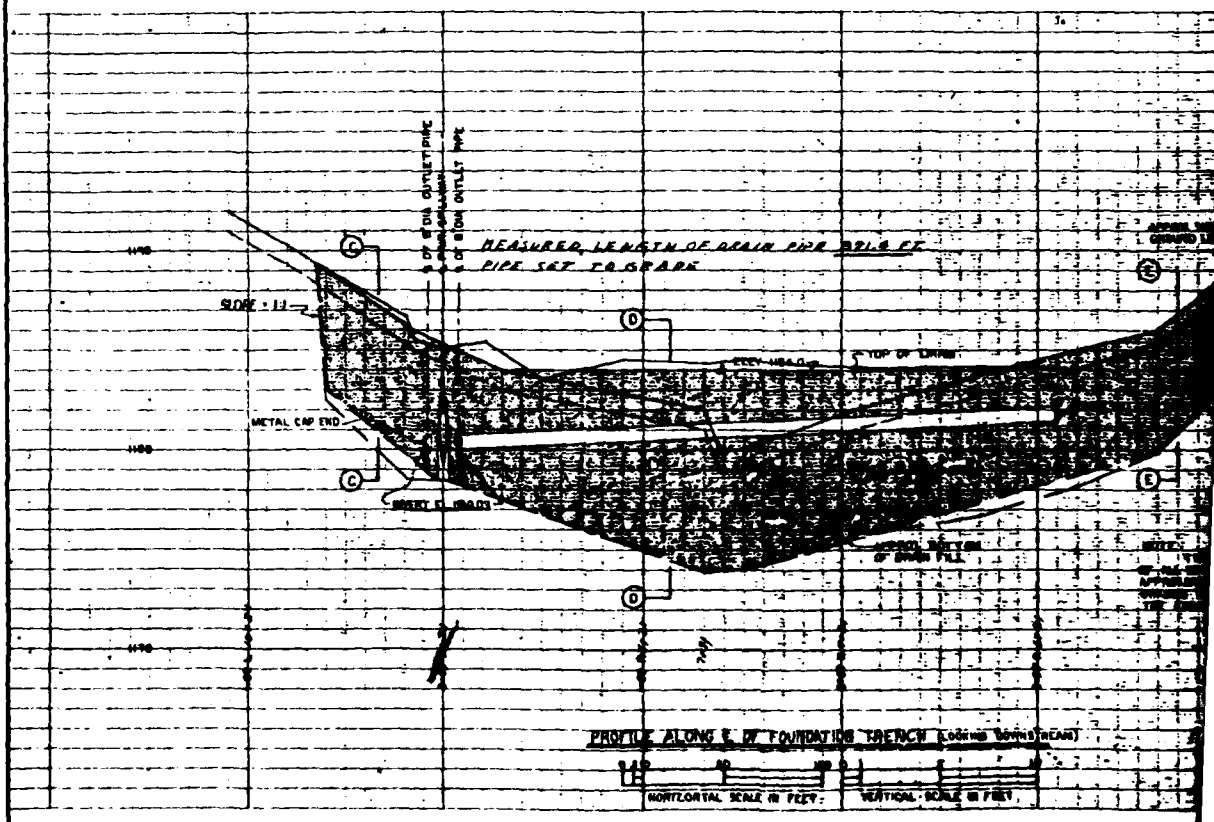


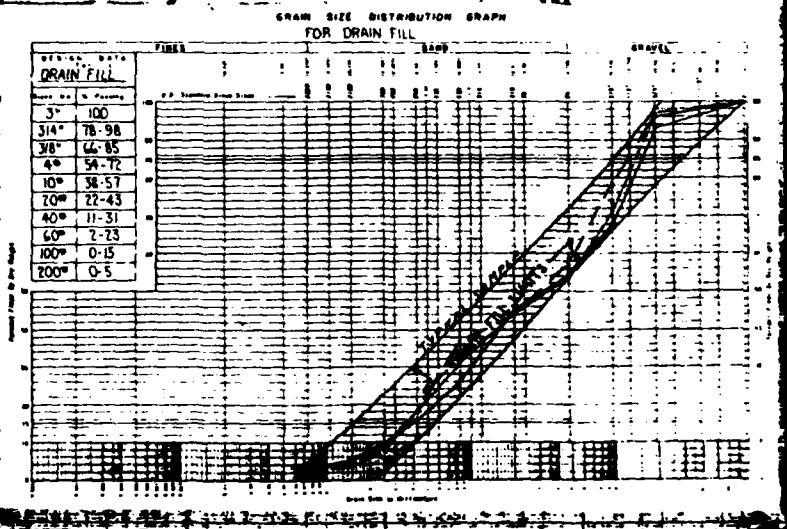
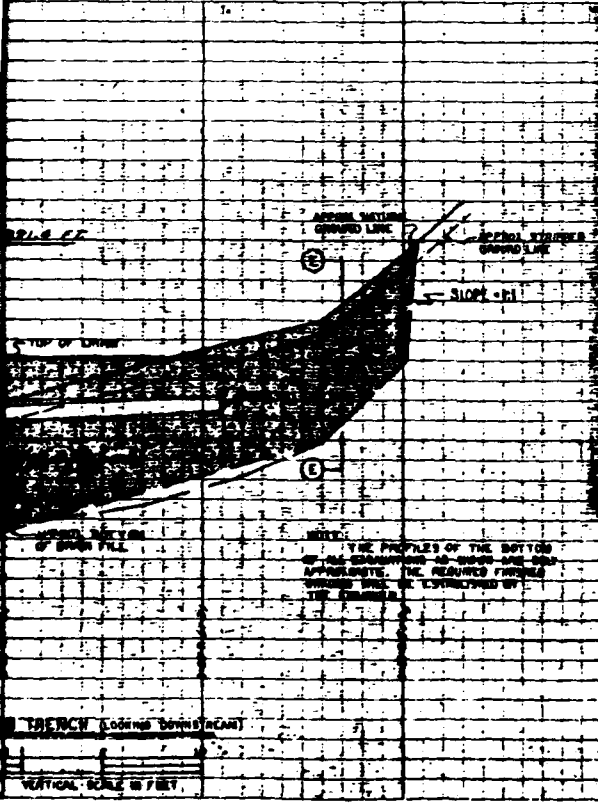
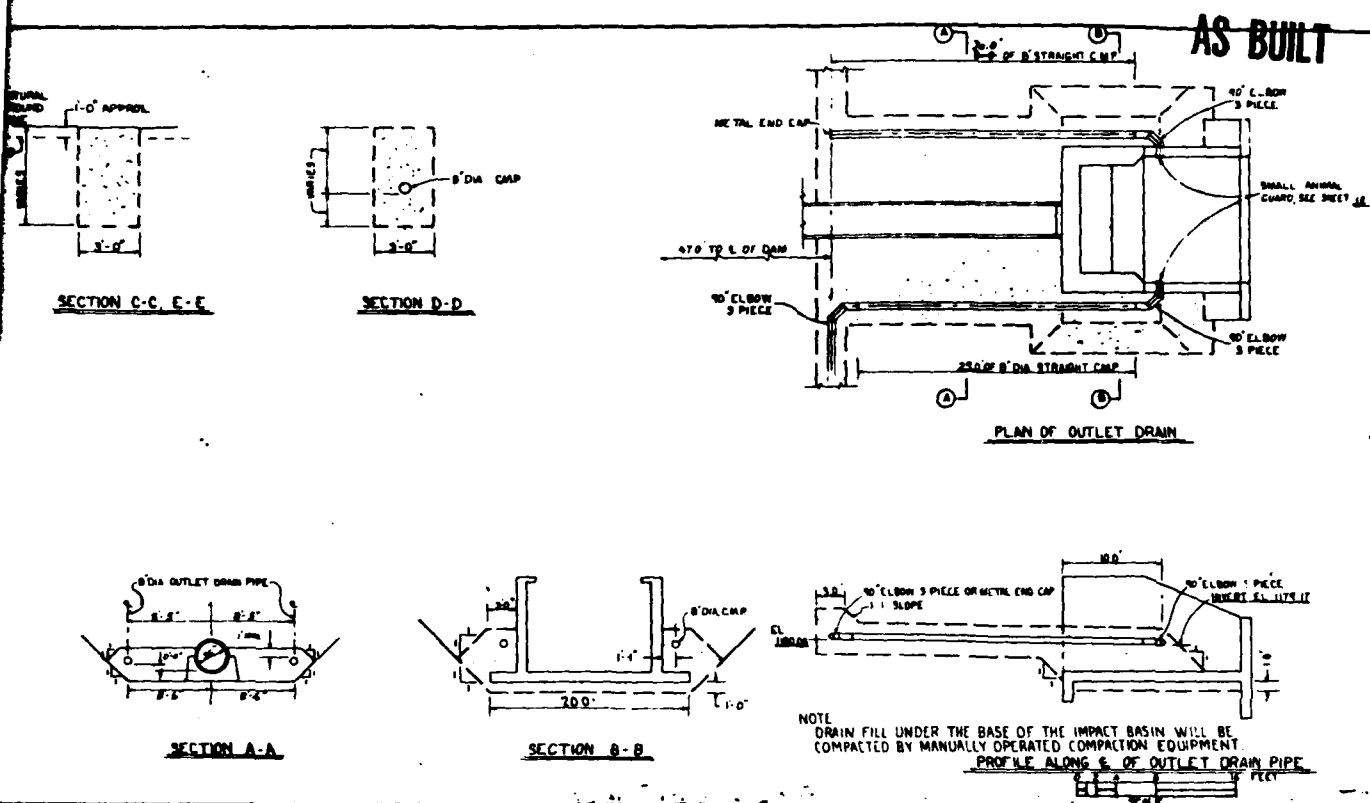
**DRAWN**  
**BY**

450 - CU VDS DRAIN FILL  
260' - OF 8" DIA C M P 16 GAGE  
3 - 90° ELBOWS - 3 PIECE  
3 - METAL END CAPS



NOTE:  
ALL DRAIN PIPE SHALL CONFORM TO MATERIAL SPEC 1104 SMALL SIZE SHAPE I, CLASS II, TYPE A, PERFORATED PIPE  
ALL PIPE SHALL BE LAID WITH PERFORATIONS DOWN





**NANTICOKE CREEK WATERSHED PROJECT**  
**SITE 9-C**  
**FLOODWATER RETARDING DAM**  
**BROOME COUNTY, NEW YORK**  
**DRAINAGE SYSTEM DETAILS**  
**U.S. DEPARTMENT OF AGRICULTURE**  
**SOIL CONSERVATION SERVICE**

Drawn by: L.C. BENTON  
 Date: 4/85

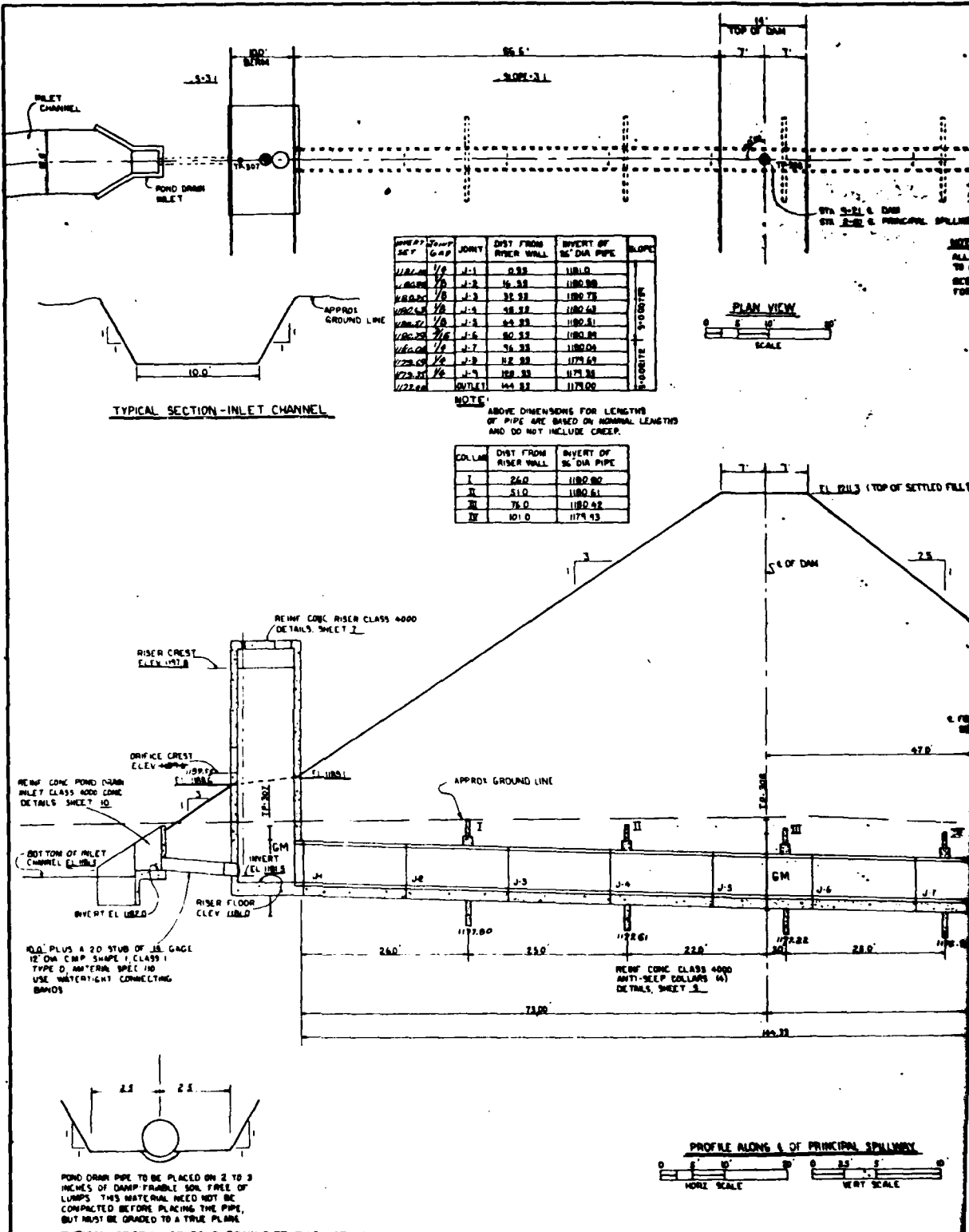
Checked by: W. YOLTON & D. ANGELO  
 Date: 4/85

Approved by: L.B.  
 Date: 5/85

Project No.: NY-2008-11

2



OR



APPENDIX F  
GEOLOGY MAP

DRAWING  
NUMBER 80-778-A3

5/2/81  
5-7-81

132

CHECKED BY

APPROVED BY

4-29-81

ACS

DRAWN  
BY

BY

BY

BY

BY

BY

BY

BY

BY

BY

BY

BY

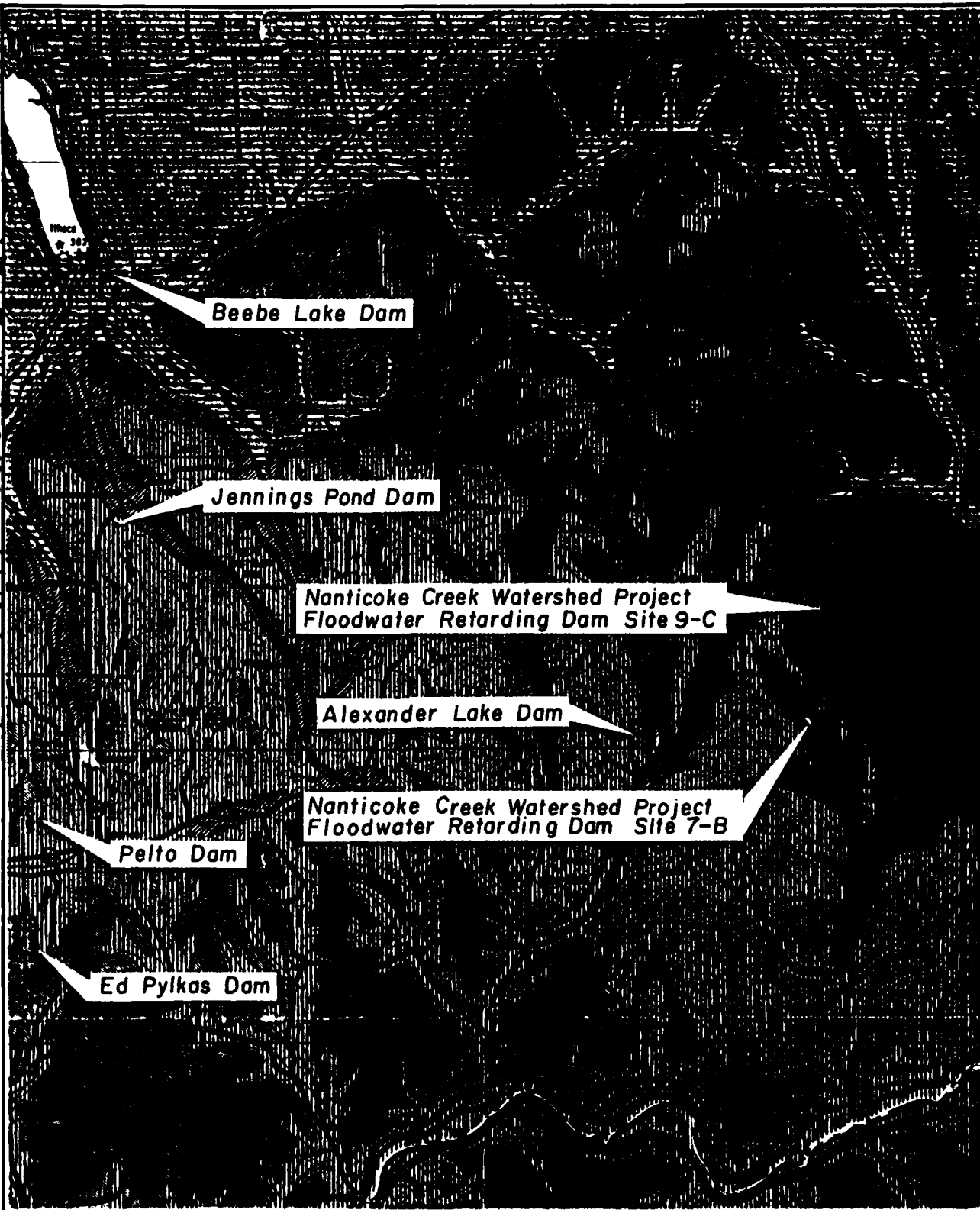
BY

BY

BY

BY

BY



SCALE

0 2 4 6 8 10 miles

GEOLOGY MAP

REFERENCE :

GEOLOGIC MAP OF NEW YORK, FINGER LAKES SHEET  
DATED: 1970, SCALE: 1:250,000

**D'APPOLONIA**

DRAWN BY ACS 4-29-81 CHECKED BY JH 5/7/81 DRAWING NUMBER 80-778-A6

## LEGEND

### CANADAWAY GROUP

800-1200 ft. (240-370 m.)



Dcy

Machias Formation—shale, siltstone; Rushford Sandstone; Caneadea, Canisteo, and Hume Shales; Canaseraga Sandstone; South Wales and Dunkirk Shales; In Pennsylvania: Towanda Formation—shale, sandstone.

### JAVA GROUP

300-700 ft. (90-210 m.)



Dj

Wiscoy Formation—sandstone, shale; Hanover and Pipe Creek Shales.

### WEST FALLS GROUP

1100-1600 ft. (340-490 m.)



Dwn

Nunda Formation—sandstone, shale.

Dwg

West Hill and Gardeau Formations—shale, siltstone; Roricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.

Dwr

lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.

Dwc

Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale.

Dwnm

"New Milford" Formation—sandstone, shale.

Dwrg

Gardeau Formation—shale, siltstone; Roricks Glen Shale.

Dws

Slide Mountain Formation—sandstone, shale, conglomerate.

Dwm

Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales

### SONYEA GROUP

200-1000 ft. (60-300 m.)

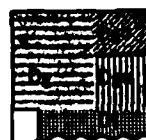


Ds

In west: Cashaqua and Middlesex Shales.  
In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.

### GENESEE GROUP AND TULLY LIMESTONE

200-1000 ft. (60-300 m.)



Dg

West River Shale; Genundewa Limestone; Penn Yan and Genesee Shales; all except Genesee replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone.

Dgo

Oneonta Formation—shale, sandstone.

Dgu

Unadilla Formation—shale, siltstone.

Dt

Tully Limestone.

GEOLOGY MAP LEGEND

#### REFERENCE:

GEOLOGIC MAP OF NEW YORK, FINGER LAKES SHEET  
DATED: 1970, SCALE: 1:250,000

**D'APPOLONIA**

APPENDIX G  
STABILITY ANALYSES

UNITED STATES GOVERNMENT

## Memorandum

TO : W. S. Atkinson, State Conservation      DATE: March 10, 1965  
Engineer, SCS, Syracuse, New York 13210

FROM : Rey S. Decker, Head, Soil Mechanics Laboratory,  
SCS, Lincoln, Nebraska 68503

SUBJECT: ENG - Soil Tests 22 - New York WP-03, Nanticoke Creek, Site No. 9-C  
(Broome County)

### ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 1 sheet.
2. Form SCS-355, Triaxial Shear Test Data, 1 sheet.
3. Form SCS-352, Compaction and Penetration Resistance Report, 4 sheets.
4. Form SCS-357, Summary - Slope Stability Analysis, 2 sheets.
5. Investigational Plans and Profiles.

### INTERPRETATION AND DISCUSSION OF DATA

#### FOUNDATION MATERIALS:

- A. Classification: The foundation at this site consists of alluvium overlying glacial till in the floodplain section. The abutments are glacial till.

The alluvium is logged as ML and the till is logged as GM.

- B. Penetration Resistance: Standard penetration resistance tests showed blow counts of from 13 to 23 in the ML alluvium below water table. The till underlying the alluvium has blow counts from 26 to more than 100 blows per foot.

The Geologist calls attention to an organic silt zone in the vicinity of TP No. 2 and DH No. 52. This zone occurs within the surface 5 feet; he suggests removal of this material.

- C. Strength and Consolidation: Outside of the low blow count material (6 blows per foot above water table) in the area of DH No. 52 and TP No. 2, the data indicates that the foundation strength will be adequate for the embankment planned and that the consolidation potential will be low.

- D. Permeability: The Geologist expects the zone logged as clean gravels to be quite permeable.

2 -- W. S. Atkinson -- 3/10/65

Rey S. Decker

Subj: ENG - Soil Tests 22 - New York WP-08, Nanticoke Creek, Site No. 9-C  
(Broome County)

#### EMBANKMENT MATERIALS:

- A. Classification: The borrow materials submitted represent the till. These samples have very comparable gradation and plasticity characteristics. They contain slightly more than 50 percent fines and about 25 to 30 percent gravel. The liquid limits are in the range of 26 to 28 and the PI's range from 7 to 9.
- B. Compacted Density: Standard Proctor compaction tests were made on the fraction passing the 3/4-inch sieve. The tests were made in accordance with ASTM D-698-53T, Method C. The compacted material represents from 83 to 88 percent of the total sample.

The maximum densities obtained fell within the close range of 123.0 p.c.f. to 124.5 p.c.f.

- C. Shear Strength: A triaxial shear test was made on the minus 3/4-inch fraction to represent the materials submitted. The test was made at a density of 121 p.c.f., which is equivalent to 97 percent of standard Proctor (ASTM D-698, Method C). The saturated shear strength values obtained were  $\phi = 22^\circ$ ,  $c = 250$  p.s.f. The test values are suggested for design.

#### SLOPE STABILITY ANALYSIS:

Slope stability was checked with a Swedish circle method of analysis. The analysis considered the embankment only.

The proposed 3:1 upstream slope has a factor of safety of 1.53 with draw-down considered.

The proposed 2 1/2:1 downstream slope has a factor of safety of 1.56 with the phreatic line controlled by a drain at  $c/b = 0.6$ .

A summary of the analysis is attached.

#### SETTLEMENT ANALYSIS:

Settlement is expected to be uniform and no problems are anticipated due to differential settlement.

#### CONCLUSIONS AND RECOMMENDATIONS

- A. Site Preparation: The channel banks and trench slopes that are normal to centerline should be no steeper than 3:1.



3 -- W. S. Atkinson -- 3/10/65

Rey S. Decker

Subj: ENG - Soil Tests 22 - New York WP-08, Nanticoke Creek, Site No. 9-C  
(Broome County)

- B. Cutoff Trench: A minimum cutoff trench depth of 5 feet is recommended for the abutments and the floodplain. Between & Station 6+50 and & Station 8+50 a trench depth of greater than 5 feet will be required to cut off the zone of clean gravel.

The trench backfill should be compacted to a minimum of 97 percent of standard Proctor (ASTM D-698, Method C) with the control based on the minus 3/4-inch fraction.

The placement moisture content should be near optimum.

- C. Principal Spillway: Three locations were investigated. The foundation at the & Station 9+30 location consists of till for the entire length of the conduit. This location was recommended by the Geologist. It appears to be the most desirable location from a foundation standpoint.

Based on the blow count data in test hole No. 53 (& Station 8+90), the till is expected to be nonyielding under the 26-foot fill at this location.

- D. Drain: A drain is recommended to control the phreatic line within the embankment and also to provide a safe outlet for foundation seepage.

A trench drain with a pipe outlet is suggested. The drain should be located at about  $c/b = 0.6$ . It should extend up the abutments to normal pool elevation. A trench depth of about 6 feet is suggested.

The till contains more than 15 percent passing the 0.005 mm. size; therefore, any reasonably well-graded, clean sand-gravel mixture could be used for the drain. The ML alluvium and the gravel zone may require a special filter gradation.

- E. Embankment Design:

1. Placement of Material: The borrow samples submitted represent a uniform till; therefore, a homogeneous embankment is recommended.

The embankment material should be placed at a minimum of 97 percent of standard Proctor density with the control based on the fraction passing the 3/4-inch sieve (ASTM D-698, Method C). The placement moisture content should be near optimum.

2. Slopes: The proposed 3:1 upstream and 2 1/2:1 downstream slopes have acceptable factors of safety and are recommended.

4 -- W. S. Atkinson -- 3/10/65

Rey S. Decker

Subj: ENG - Soil Tests 22 - New York WP-08, Nanticoke Creek, Site No. 9-C  
(Broome County)

3. Settlement: An overfill allowance of 1.0 foot is suggested to compensate for residual consolidation within the fill and foundation.

Prepared by:

Lorn P. Dunnigan  
Lorn P. Dunnigan

Reviewed and Approved by:

Roland B. Phillips  
Roland B. Phillips

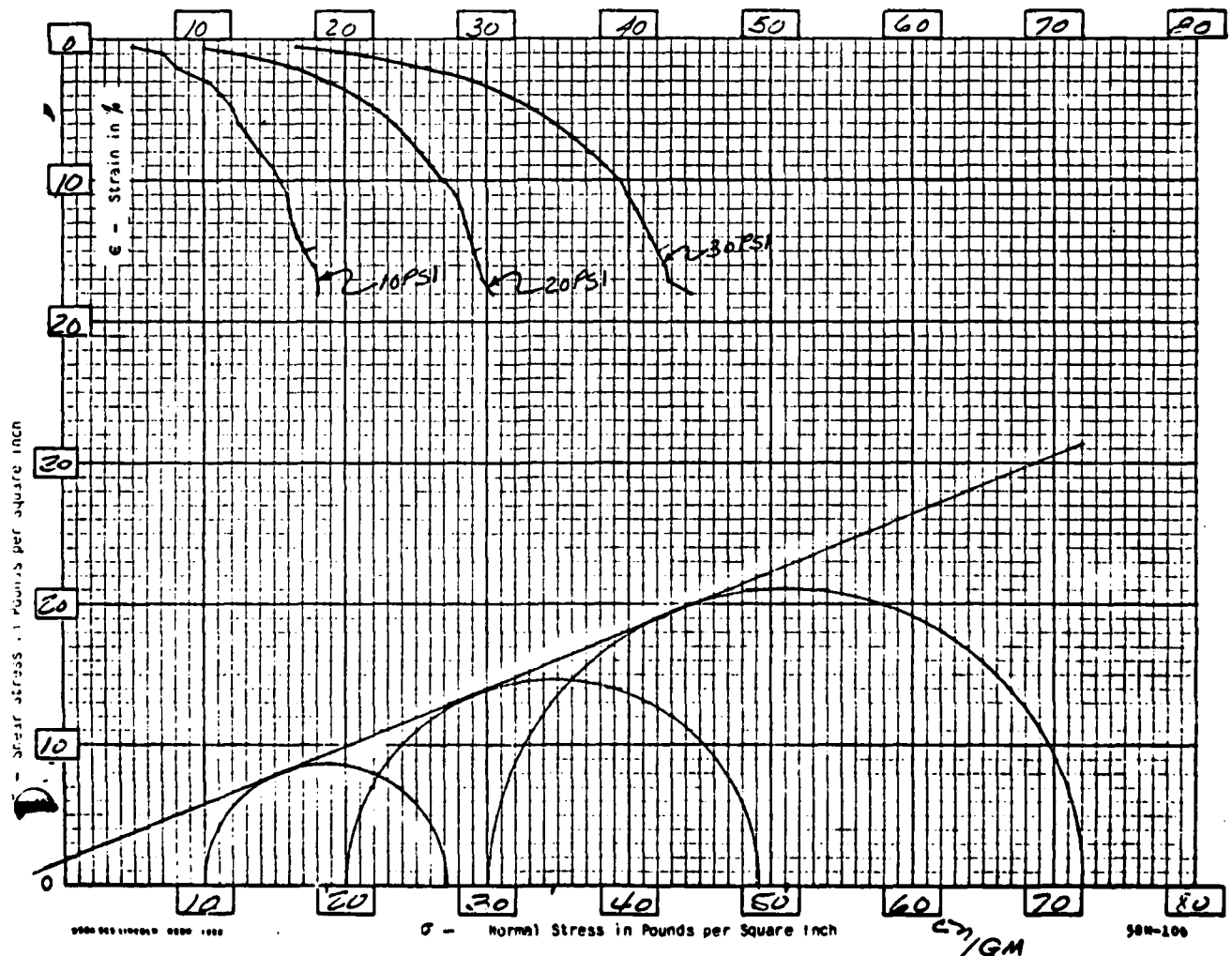
Attachments

cc: Bernard S. Ellis, Syracuse, New York  
Henry W. Davis, PennYan, New York  
Richard J. McClimans, Binghamton, New York  
H. M. Kautz, Upper Darby, Pennsylvania  
W. L. Anderson, Syracuse, New York

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
SOIL MECHANICS LABORATORY  
TRIAxIAL SHEAR TEST DATA

Sample Number 65W1817Project Nanticoke #9-CLocation New York

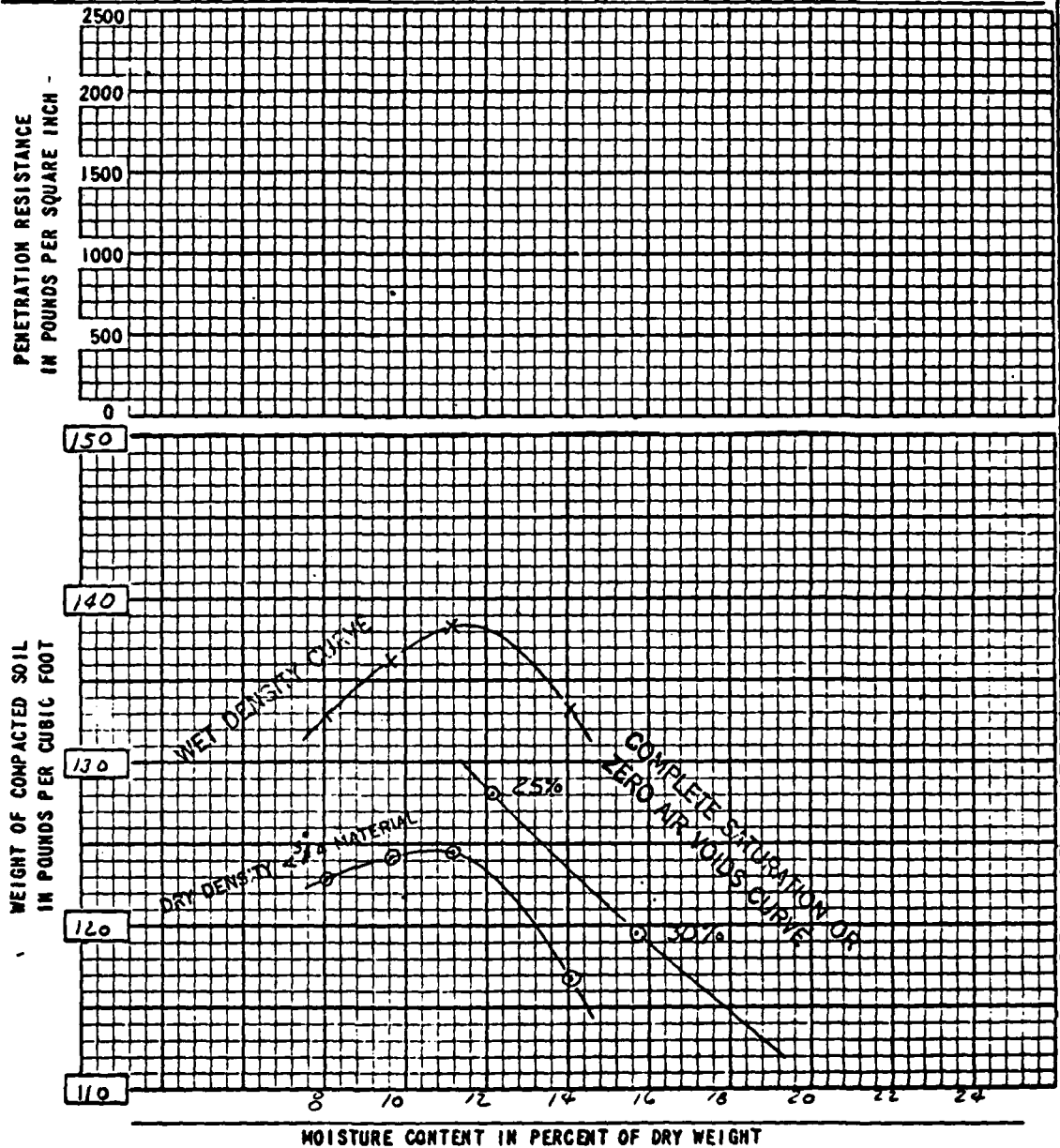
Moisture-Density Data				Specifications:							
Standard <input checked="" type="checkbox"/>	Max. $\gamma$ <u>124.5</u> pcf			Specimen: Max. <u>3</u> "	<input checked="" type="checkbox"/> Consolidated	<input type="checkbox"/> Drained					
Modified <input type="checkbox"/>	Optimum Moisture <u>11.0</u> %			Height <u>4</u> "	<input type="checkbox"/> Unconsolidated	<input checked="" type="checkbox"/> Undrained					
Curve No. <u>1X of 4</u>				Diameter <u>4.0</u> "	Material						
L.L. <u>26</u> P.L. <u>3</u> Class <u>CL</u> $G_s$ <u>2.74</u>											
% Finer Than: 0.002mm <u>14.0</u> 0.005mm <u>20</u> #200 <u>51</u>											
Other Factors Affecting Shear:											
% Dispersion <u>43</u>	% Salt										
Other:				<input type="checkbox"/> Undisturbed and Tested at: <input type="checkbox"/> Natural Moisture <input type="checkbox"/> Saturation <input checked="" type="checkbox"/> Remolded and Tested at: <u>95</u> % of <input checked="" type="checkbox"/> Standard <input type="checkbox"/> Modified with $w =$ _____ % which is <input type="checkbox"/> Lower than Optimum <input type="checkbox"/> Optimum <input type="checkbox"/> Higher than Optimum <input type="checkbox"/> Saturated							
Test Data											
Dry Density $\gamma$ pcf	% Max. Dry Den.	Moisture Content			Lateral Pressure $\sigma_3$	Consolidation Data		Stress at Failure $\sigma_1 - \sigma_3$	% Strain at Failure $\epsilon$	Internal Friction $\phi$ Tan $\phi$	Unit Cohesion
		Start %	% Sat. Start	End %		Orig. $e_0$	Final $e_f$				
121.0	91.2	14.2	91.0	13.6	10	1.124	0.383	17.2	15	$\phi$	1.7 psi 250 psf
120.4	96.7	14.3	93.5	12.6	20	1.076	0.370	29.2	15	22°	
121.0	97.2	13.7	90.7	12.2	30	1.124	0.363	42.1	15	Tan $\phi$ 0.404	

 $\sigma_1 - \sigma_3$  in Pounds per Square Inch

## COMPACTION AND PENETRATION RESISTANCE REPORT

Date \_\_\_\_\_ Sample No.: Field 202.1 Lab 65 W 1817Project Nanticoke Creek No. 9-C Location New YorkSample Location and Depth Emer. Spill. 10'-10.0'

Signature: \_\_\_\_\_



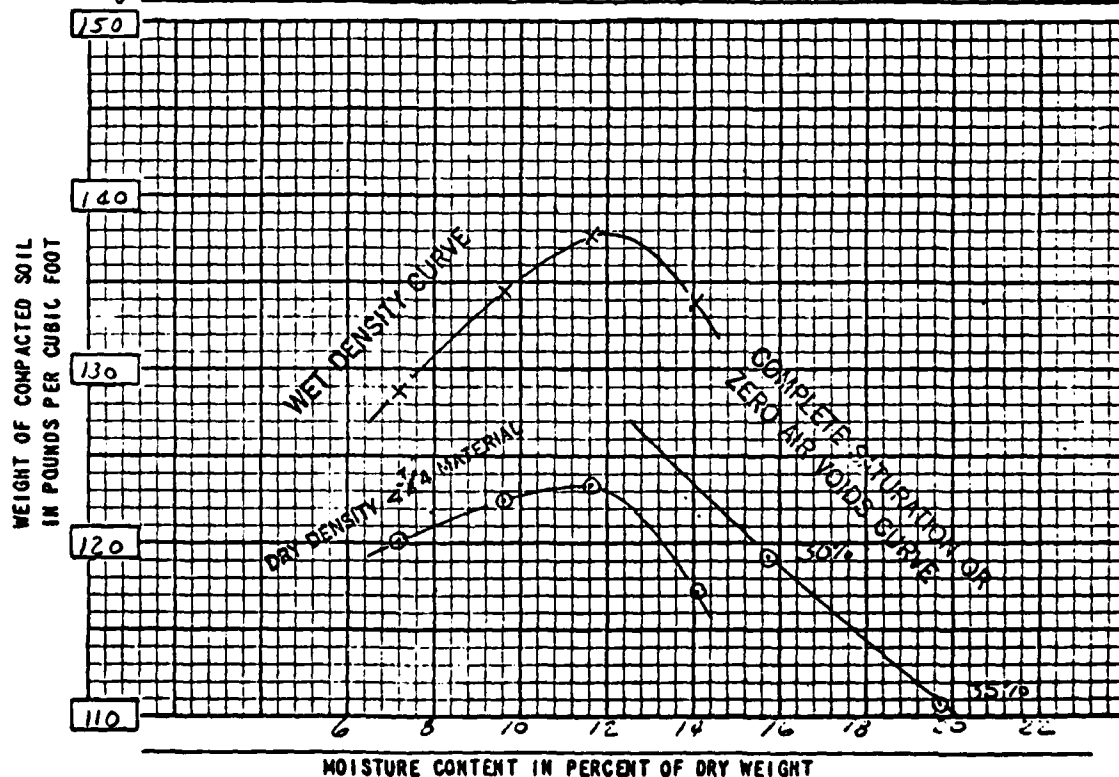
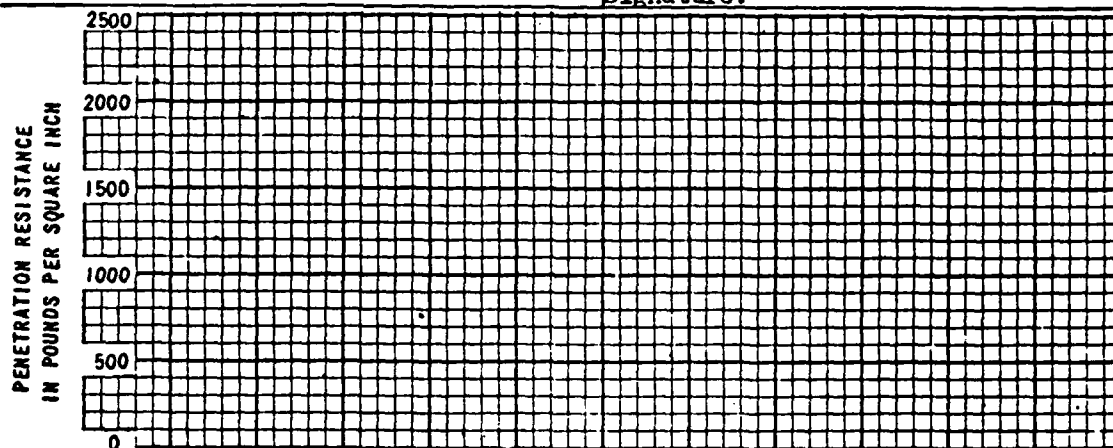
TYPE OF TEST	TEST PROCEDURE	Classification
<input checked="" type="checkbox"/> Standard Proctor	Weight of Hammer <u>5.5</u> Lbs.	<u>CL</u>
<input type="checkbox"/> Modified AASHO	Drop <u>12</u> Inches	<u>83</u> % Material Compacted
<input type="checkbox"/> Other _____	Lifts <u>3</u>	Passed <u>3/4"</u> Sieve
ASTM D698-54T Method C	Vol. of Cylinder <u>1/30</u> Cu. Ft.	(Sp. Gr.) $G_s = 2.74$ gr/cc
		Curve <u>1X</u> of <u>4X</u>

50-M26

## COMPACTION AND PENETRATION RESISTANCE REPORT

Date \_\_\_\_\_ Sample No.: Field 204.1 Lab 65W1818Project Naticum Creek No. 9-C Location New YorkSample Location and Depth Emer. Spill 10'-12.0'

Signature: \_\_\_\_\_



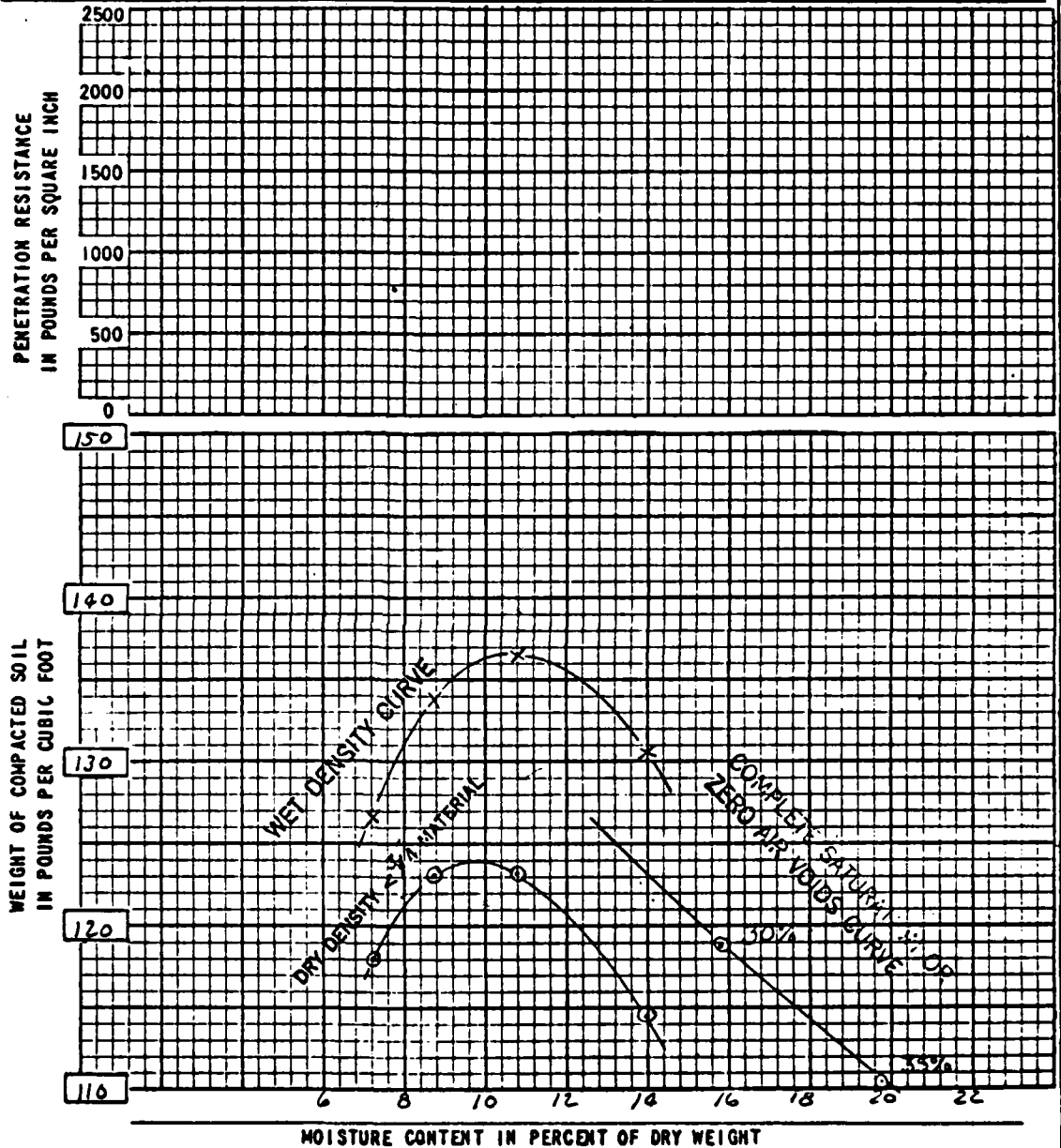
TYPE OF TEST	TEST PROCEDURE	Classification
<input checked="" type="checkbox"/> Standard Proctor	Weight of Hammer <u>5.5</u> Lbs.	<u>CL</u>
<input type="checkbox"/> Modified AASHO	Drop <u>12</u> Inches	<u>87</u> % Material Compacted
<input type="checkbox"/> Other _____	Lifts <u>3</u>	Passed <u>3/4"</u> Sieve
ASTM D698-SAT Method C	Vol. of Cylinder <u>1/30</u> Cu. Ft.	(Sp. Gr.) <u>Gs = 2.73</u> gr/cc
		Curve <u>2X</u> of <u>4X</u>

50-M26

## COMPACTION AND PENETRATION RESISTANCE REPORT

Date \_\_\_\_\_ Sample No.: Field 205/207.1 Lab 65W1819Project Naticoke Creek No. 9-C Location New YorkSample Location and Depth Emen Spill 1.0'-11.0'

Signature: \_\_\_\_\_



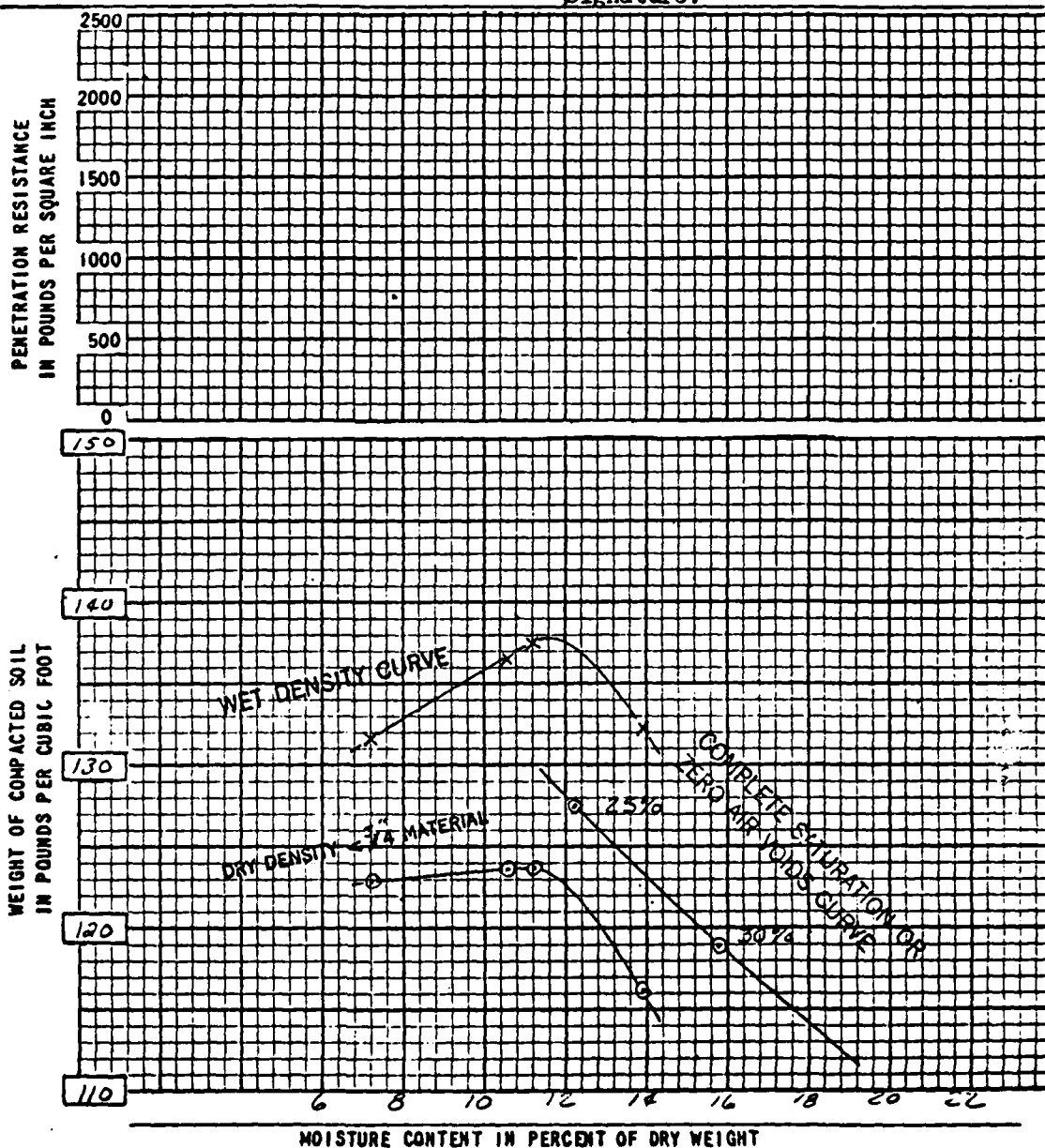
TYPE OF TEST		TEST PROCEDURE		Classification $CL^{*}CL-MC$	
<input checked="" type="checkbox"/>	Standard Proctor	Weight of Hammer	<u>5.5</u> Lbs.	<u>88</u> % Material Compacted	
<input type="checkbox"/>	Modified AASHO	Drop	<u>12</u> Inches	Passed <u>3/4"</u> Sieve	
<input type="checkbox"/>	Other _____	Lifts	<u>3</u>	(Sp. Gr.) $G_s = 2.72$ gr/cc	
ASTM D698-58T Method C		Vol. of Cylinder	<u>1/30</u> Cu. Ft.	Curve <u>3x</u> of <u>4x</u>	

58-M26

## COMPACTION AND PENETRATION RESISTANCE REPORT

Date \_\_\_\_\_ Sample No.: Field 206.1 Lab 65W1820Project Nanticoke Creek No. 9-C Location New YorkSample Location and Depth Emer. Spill 1.0'-13.0'

Signature: \_\_\_\_\_



TYPE OF TEST		TEST PROCEDURE		Classification $CL - CL - ML$	
<input checked="" type="checkbox"/>	Standard Proctor	Weight of Hammer	<u>5.5</u> Lbs.	<u>08</u>	% Material Compacted
<input type="checkbox"/>	Modified AASHO	Drop	<u>12</u> Inches	Passed	<u>3/4"</u> Sieve
<input type="checkbox"/>	Other _____	Lifts	<u>3</u>	(Sp. Gr.) $G_s =$	<u>2.72</u> gr/cc
ASTM D494-SAT Method C		Vol. of Cylinder	<u>1/30</u> Cu.Ft.	Curve <u>XX</u>	of <u>XX</u>

50-M26

SUMMARY - SLOPE STABILITY ANALYSIS

State NEW YORK Project NANTICOK CREEK SITE #9-C

Date 5-4-65 Analysis Made By A.W.L. Checked By T.C.H.

Method of Analysis SWEDISH CIRCLE

Location of Material											
Sample No.											
$\gamma_d$											
$\gamma_m$											
$\gamma_s$											
$\gamma_b$											
Condition	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	
$\phi$											
Tan $\phi$											
K											
C											

UPSTREAM SLOPE			
Trial	Slope	Conditions	Fs
5	5:1	Fill from 10' berm @ elev 1190.0 - Arc cut from opp. shldr thru Emb (22.0°-250°) only	1.53
DOWNSTREAM SLOPE			
1	2 1/2:1	No drain - No berm - Arc cut from opp. shldr thru Emb (22.0°-250°) only	1.35
1A	2 1/2:1	Same as #1 except 10' berm @ elev 1190.0	1.49
1B	2 1/2:1	Drain @ % = 0.6 - No berm - Arc cut from opp. shldr thru Emb (22.0°-250°) only	1.56
2	2 1/2:1	No drain - No berm - Arc cut from opp. shldr thru Emb (22.0°-250°) only	1.51
3	2 1/2:1	No drain - 10' berm @ elev 1190 - Arc cut from opp. shldr thru Emb (22.0°-250°) only	1.51

DOWNSTREAM SLOPE (Cont.)			
Trial	Slope	Conditions	Fs
3A	2 1/2:1	Same as #3 except Drain @ % = 0.6 - No berm	1.51
4	2 1/2:1	No drain - 10' berm @ elev 1190.0 - Arc cut from opp. shldr thru Emb (22.0°-250°) only	1.51
4A	2 1/2:1	Same as #4 except Drain @ % = 0.6 - No berm	1.49
Std shear values used in all trials			

To be used to report to field offices data used for slope stability analyses and the results of the analyses. The right side of the form will be used for a sketch of the embankment on which the analyses have been made.





APPENDIX H

REFERENCES

## APPENDIX H

### REFERENCES

Broughton, J. G., D. W. Fisher, Y. W. Isachsen, and L. V. Rickard, 1966, "Geology of New York," New York State Museum and Science Service, Educational Leaflet 20, 50 pp.

Fisher, D. W., Y. W. Isachsen, and L. V. Rickard, 1971, "Generalized Tectonic-Metamorphic Map of New York," New York Museum and Science Service, Map and Chart Series No. 15.

Flint, R. F., 1971, Glacial and Quaternary Geology, John Wiley and Sons, Inc., 892 pp.

Rickard, L. V. and D. W. Fisher, 1970, "Geologic Map of New York, Finger Lakes Sheet," New York State Museum and Science Service, Map and Chart Series No. 15.

Thornburg, W. D., 1965, Regional Geomorphology of the United States, John Wiley & Sons, Inc., 609 pp.

U.S. Army Corps of Engineers, 1956, Hydrometeorological Report No. 33.

U.S. Department of Commerce, 1965, Weather Bureau Hydrometeorological Report No. 40.

U.S. Department of the Interior, Bureau of Reclamation, 1974, Design of Small Dams.

Wright, H. E., Jr. and D. G. Frey, 1965, The Quaternary of the United States, Princeton University Press, 922 pp.

**DA  
FILM**